AUGUST 1943

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ENGINEERING
CONSTRUCTION
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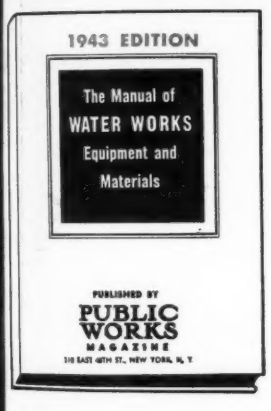
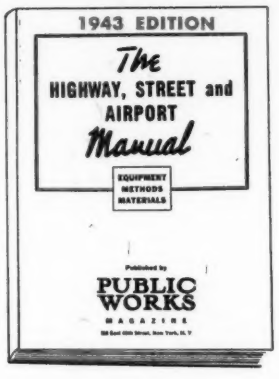
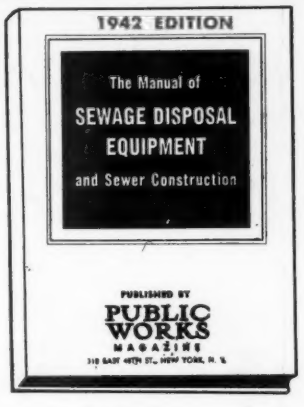
OPERATION

Public Works







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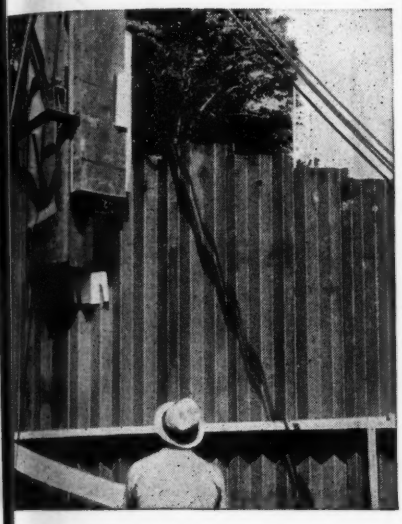

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Vol. 74 No. 8

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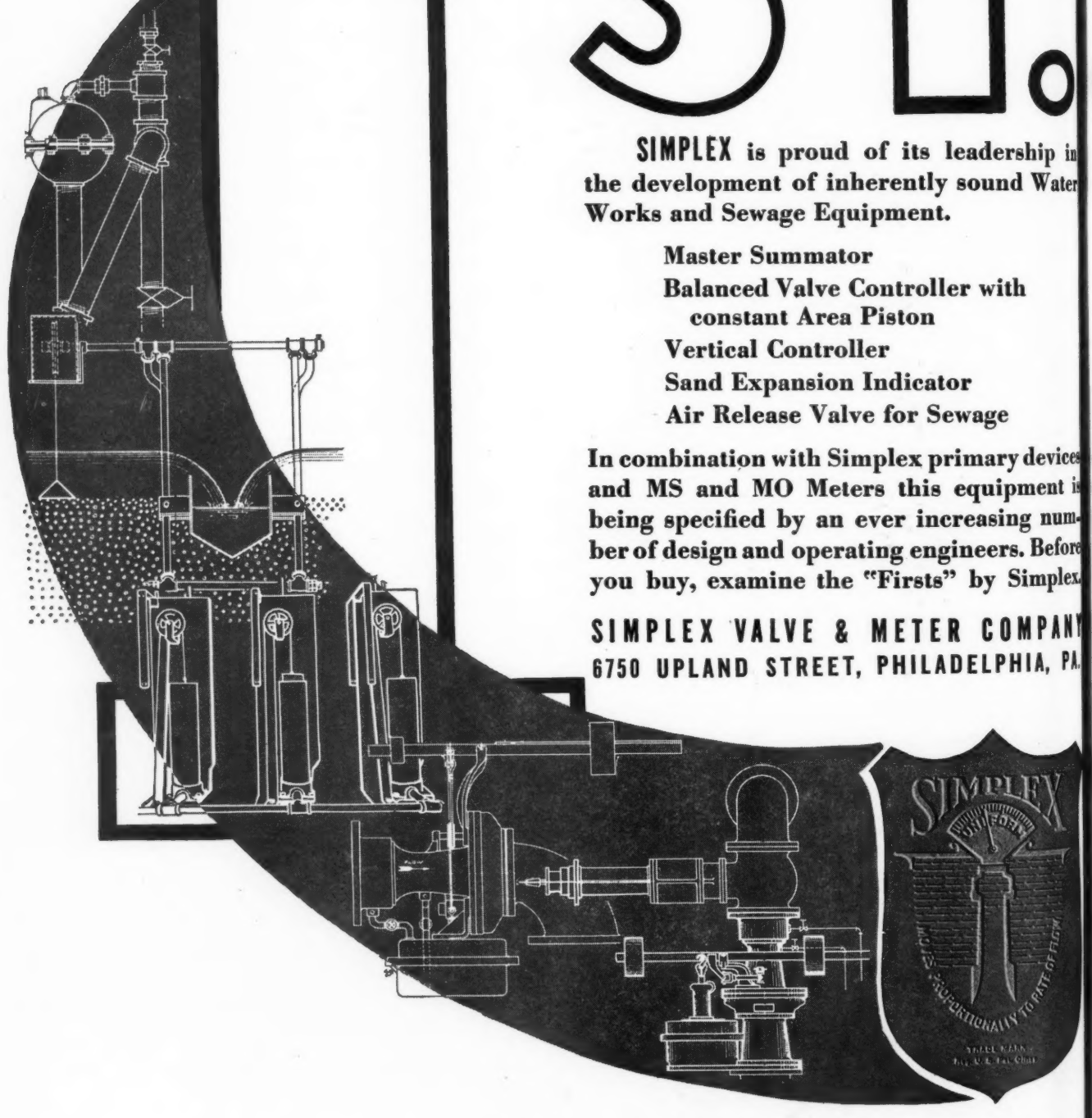

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THE WAR EMERGENCY

Postwar Planning Bill a Law

On July 13th the President signed the postwar planning bill (H. R. 2798). This prevents the loss of approximately $68,000,000 of federal aid road funds which otherwise would have been concelled; and an additional $103,000,000 which would expire July 1, 1944 unless obligated before that time. This law sets up a $50,000,000 highway planning fund to be apportioned among the states in accordance with the provisions of Section 21 of the Federal Highway Act. Allocations under these provisions range from a minimum of $250,000 to a maximum of $3,252,287, which goes to Texas. New York, Pennsylvania and California each receive over $2,000,000, while there are 15 states in the million to two million bracket. At least an equal sum is to be put up by the states. This is additional to the $20,000,000 advance engineering program already under way.

There was also an increase of $200,000,000 in the authorization for public works and public services programs under the Lanham Act, with $50,000,000 for immediate use. In apportioning these appropriations, water works, sewers and hospitals will be given preference, followed by schools, roads and streets, and recreation centers; to be located where the need is most acute and is due to war activities. The construction work will be done by private contractors.

Road projects include work in Costa Rica on the Inter-American Highway and in Alaska; flight strips and access roads; and repair and reconstruction of flood-damaged roads.

Highway Projects Halted

WPB announces that it has halted the following highway projects: A bridge in Kentucky. In Louisiana, 7.67 miles of soil-cement base with bituminous treatment. In Michigan, widening a mile of highway. In Texas, constructing 17.7 miles of concrete pavement, with grading, etc. In Arkansas, an access road. In Florida, a 24 ft. paving project. In Georgia, widening part of U. S. No. 78. In North Carolina, widening two bridges, improvement of three roads totaling about 2 miles, and constructing 8.5 miles of new road. In Alabama, temporary changing of a 0.72 mile four-lane concrete road project to two lanes. It removed a stop order on a reinforced concrete and steel bridge on U. S. No. 52 in South Carolina.

Snow Plow Repair Parts

Snow Plow Repair Parts for actual or impending breakdown or to maintain equipment in sound working condition, but not for inventory or stock, may be purchased by federal, state, county, municipal or local highway or street departments, also by public or private institutions engaged in educational, religious or charitable activities, such as schools, libraries, hospitals, welfare agencies, churches, etc., by furnishing the following signed certifications:

(a) CMP Certification No. 7 (or 5-A) Marked: "MRO-5A".

(b) L-192 Certification properly filled in.

(L-192 Certification is not required from dealers).

Repairs and Repair Parts for maintenance, repair and operating supplies for persons and other activities not listed above (and not otherwise provided for by other applicable regulations) may be furnished on the following signed certification:

(a) CMP Certification No. 7 (or 5) Marked: "MRO-5—Preference Rating A-10."

C.M.P. ALLOTMENT SYMBOL—MRO-5A

The undersigned purchaser certifies, subject to the penalties of section 35 (a) of the United States Criminal Code, to the seller and to the War Production Board, that, to the best of his knowledge and belief, the undersigned is authorized under applicable War Production Board regulations or orders to place this delivery order, to receive the items ordered for the purpose for which ordered, and to use any preference rating or allotment number or symbol which the undersigned has placed on this order.

.....

By.....

L-192 CERTIFICATION

This order covers Repair Parts needed for actual or impending breakdown or maintenance of snow plow equipment which has been registered under L-196. Model No.....
Serial No..... Rating.....
Project Identification: Highway Maintenance, in accordance with Limitation Order L-192 with the terms of which I am familiar.

Purchaser .....

Date..... By.....

Wartime and Peacetime Planning

Most of us got the first news of it over the radio. "The Allies have landed in Sicily with an armada of 2,000 boats." To us it was news. But to our war chiefs it was but the culmination of months of planning. Those two thousand boats weren't just telephoned for the day previous—the landing barges and other special craft had been planned and ordered months in advance, and arrangements for the others involved careful planning to have them all, scattered over thousands of leagues, gather at the designated Mediterranean ports in time.

The planning could not stop there. Men by the tens of thousands were going into Sicily and must be fed regularly. Every day now hundreds of tons of food, arms and ammunition by the thousands of tons, even cigarettes by the thousands of cartons, must reach the men. They also were ordered months before and were on the way from the United States weeks before.

Planning—planning—planning. Our boys can fight —they have proved it—but that would get them nowhere without the planning of the war chiefs.

Some day the war will be over and the boys will land on *these* shores by the tens of thousands. And again they will need to feed regularly, and to work for that food. And our boys can do peacetime work—they have proved that too—but their ability and willingness will get them nowhere without the planning

(Continued on page 33)

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WATER palatability is a delicate subject in communities where water supplies are affected with seasonal odors or tastes. If you have such a problem why not follow the example set by over 1,200 cities who use Aqua Nuchar Activated Carbon to remove off-odors and tastes and deliver to their taxpayers palatable drinking water.

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PUBLIC WORKS Magazine . . . August, 1943

Vol. 74. No. 8

Hohman Street, Hammond. Cars for three blocks held up at railroad crossing. Track elevation to eliminate several of these crossings is part of the city's postwar program.

Public Works Programs

By CLARENCE A. MASON
Acting City Engineer, Hammond, Ind.

How Hammond, Ind., prepared a comprehensive program of desirable public works, laid out as a 20-year program, ready for immediate postwar construction. Abstract of a report prepared at the request of the Hammond Chamber of Commerce.

ONE of the most important jobs of present-day civil administrations is the development of a public works program. It should not be done hurriedly, but the proper municipal officers should use the utmost care in so planning that when a long-range—say 20-year—program has been carried out, the result will be what the community really wants. It should never be a hit or miss proposition. Perhaps a description of what Hammond, Ind., has done in this line will aid others in preparing such programs for cities of approximately similar size.

Hammond has a population of about 75,000, with a mayor and councilmanic form of government. The city built a filtration plant for its water supply in 1935. In that year the State ordered Hammond, Whiting, East Chicago and Gary to cease polluting Lake Michigan and the Little and Grand Calumet rivers, and sewage plants have been or are being built in all four cities. Such projects, ordered by State or Federal authority, form "must" features of a public works program.

In 1935 the city administration furnished to the Federal government a 10-year public works program totaling $17,000,000. Of this, approximately 65% has been completed in eight years. In 1942 the city sent to the Federal Works Reserve in Washington a public works program for a 20-year period which it had prepared. This program contains 24 items, among which are track elevation; four viaducts; three storm sewers; two parks; rebuilding, widening, extending and straightening eight streets; street car rail salvage; two bridges, and an incinerator plant at the sewage treatment works. Three or four of these items have already been completed. The list is being studied by a Chamber of Commerce group, who may approve or disapprove of it or of separate items, or add to them.

In addition to the public works program, the school board was asked to furnish a program, which probably

Another postwar project—replacing a bridge 35 to 40 years old.

would include eight new school buildings costing about $4,370,000.

In preparing our public works program, we studied each item with regard to its

1. Absolute need and importance.
2. Economic value.
3. Cost.
4. Ability of taxpayers to pay.
5. Effect on local business and manufacturers.

What Federal aid can be expected in the future it is impossible to say. A program should be based upon the revenues that can reasonably be anticipated without Federal help. If such help should become available, the funds then can be stretched over more projects.

The first objective of a public works program should be to assure the actual prosecution of the projects included in that program.

The second objective should be the provision of funds to actually make plans and specifications for the projects in the order of their importance.

Decision of the order in which the projects are to be undertaken is very important. All groups of citizens should be asked to aid in reaching the decision, perhaps including a Chamber of Commerce committee, representatives of luncheon clubs, the local Board of Works, together with the local newspapers. Even John Doe on the street has ideas and should be consulted. Once a decision has been made, the plans and specifications for all the projects should be prepared as soon as possible.

Projects to Be Considered

The traffic light situation in our community, as in most communities, needs a great deal of study to determine the answers to questions such as: "Are we ready for the adoption of 4-light heads?" "Should we have a complete system of progressive lights where possible?" "What types and sizes of lights should be used to be sure of continuity of manufacture?"

The parking situation is never satisfactory in any community, and study may properly be given to such questions as "Shall the city buy property and make additional parking lots?" "Shall we pass a law enabling the city to condemn vacant property and use it as a parking lot?"

The trailer camp situation is acute because of lack of housing and the war effort. Should the city build and operate a camp and remove trailers from all other locations?

Is an airport desirable? Does the present activity of plane manufacture and travel presage the necessity of an airport after the war?

In adopting a plan, consideration should be given to its effect on neighboring cities. Many public works must be coordinated with their desires and needs; we should never attempt to build works that will adversely affect them. Cooperation between city governments is possible if properly approached. Also cooperation with the state highway department in improving highways within the city limits may be necessary.

Economic Values and Cost

The most important consideration after selection of projects is their economic value. For example, Hammond is talking of track elevation; we should consider the possibility of a drop in real estate values of property facing such a structure and in the adjacent district. Or will its benefits result in increased values?

After a complete program has been adopted and sufficient planning has been done, costs should be estimated. Most public works programs are built during bad times, when prices will be lower than they are today, and this should be taken into account.

Ability of Taxpayers to Pay

Next comes consideration of the ability of the taxpayers to provide the necessary funds—a delicate part of the planning. There is in every community a group satisfied with things as they are, who will oppose a farseeing program. Many business men lack insight into the future and can see no good in such a program. There are taxpayers' groups who try to stop all such programs because they will increase the tax rate. Many of their objections arise from lack of adequate information on the projects; those in charge of the program must fully inform all groups or the program will fail because of lack of sponsors.

Effects on Business and Manufacturers

Last, but by no means least, is the necessity for studying the effects of the program on local business and manufacturers. If it adds so much to the cost of doing business that they cannot compete in their own field with others not so burdened, then the program should be dropped.

But if such a program can be worked out so that the business man and the manufacturer are helped, then you will have an ideal setup, and these two groups will help put it over. And it can be assumed that by helping these two groups you are also helping the great majority of the city's population.

We thoroughly agree with the ideas of Frank W. Herring, Assistant Director of the National Resources Planning Board, who has said: "Programming of public improvements is only long term capital budgeting. It has been said that it can serve as a bridge be-

(Continued on page 26)

Wreck of the car of Mayor O'Connor and his death caused by lack of a grade separation structure.

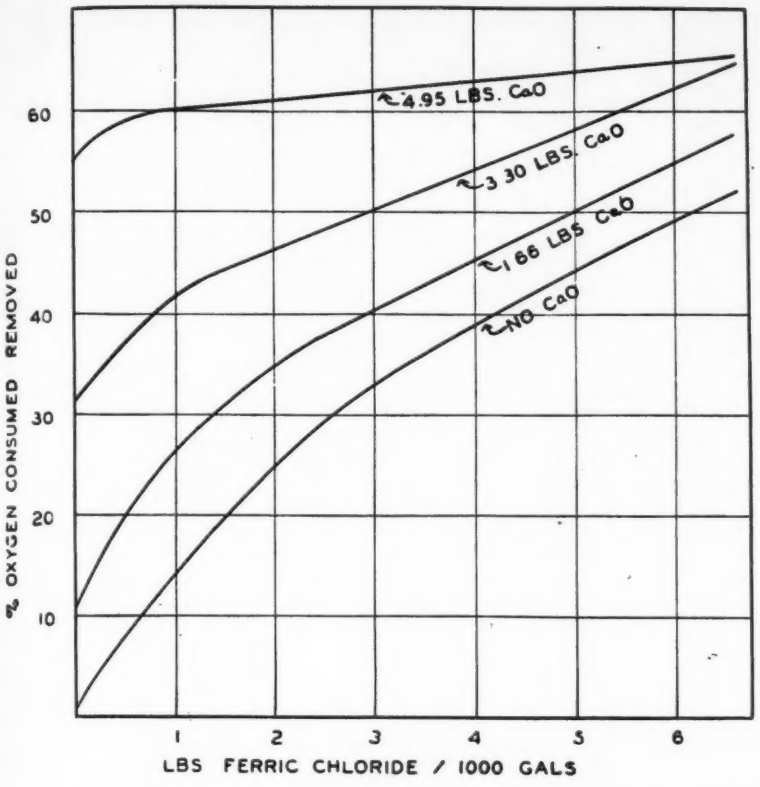


Fig. 3—Effects on oxygen-consumed removal of using various quantities of saturated lime solution in conjunction with ferric chloride.

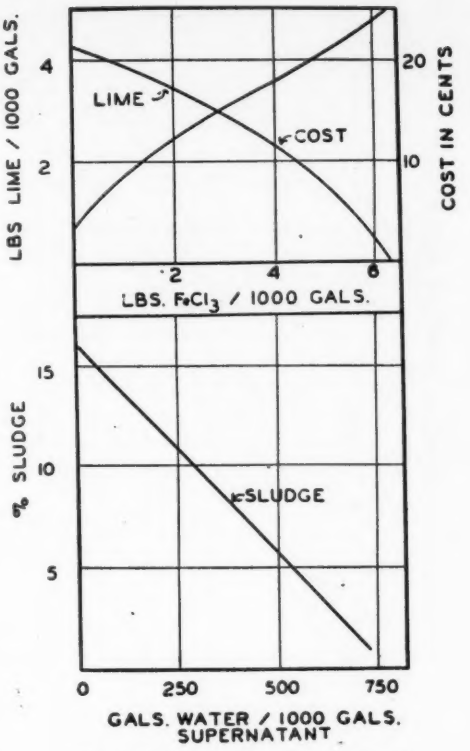


Fig. 4—Relation between amount of water used and sludge formed. Above, relation between cost and quantities of lime required.

Treatment of Supernatant Digester Liquor

By **WILLEM RUDOLFS** and **L. L. FAULK**
Chief and Assistant, Dept. Water and Sewage Research,
New Brunswick, New Jersey

In using ferric chloride and lime (the most effective chemicals) what are the optimum quantities of each? What type of lime is best? And how should they be applied? The answers are given in this article.

TREATMENT of supernatant digester liquor is still a problem at many of the smaller sewage treatment plants, particularly where the activated sludge process is employed. Dewatering of the material on sand beds, set aside for the purpose, and returning the underdrain liquor to the influent can be practiced where relatively small quantities of liquor are present, sufficient sand bed area is available and possible odors are not important. Returning the untreated liquor to the settling tanks causes some deterioration of the effluent. If the settling devices are followed by oxidation units an additional concentrated load must be handled.

Chemical treatment of the liquor is possible and at relatively low cost. Application of sulfuric acid for neutralization and coagulation is of little value. Sulfuric acid addition to reduce the coagulant demand does not help materially and causes considerable odor. Ferric chloride causes effective clarification of the liquor, but causes release of carbon dioxide, resulting in sludge expansion and floating. Alum alone or in conjunction with acid, alkali or lime does not produce a well-clarified liquor. Chlorination is expensive and produces poor results. Calcium chloride alone is not very effective and used in conjunction with ferric chloride or alum is detrimental. Treatment with ferric chloride and lime gives the best results.

In practical operation the questions arising resolve themselves mostly about the following:

1. Optimum quantities of lime and ferric chloride required.
2. Type of lime to be used.
3. Method of application.

The results recorded below are designed to answer these questions in general.

Procedure

Supernatant liquor was collected from several plants, mixed with coagulants and allowed to settle for one hour. Oxygen consumed, turbidity and pH were determined on the liquor, and the volumes of sludge recorded. Lime was added dry, as a slurry and as a saturated solution. When used as a slurry or saturated solution the results were calculated on the basis of the original liquor to allow ready comparison. Lime and ferric chloride were added in varying quantities.

Stirring. Approximately equal results were obtained

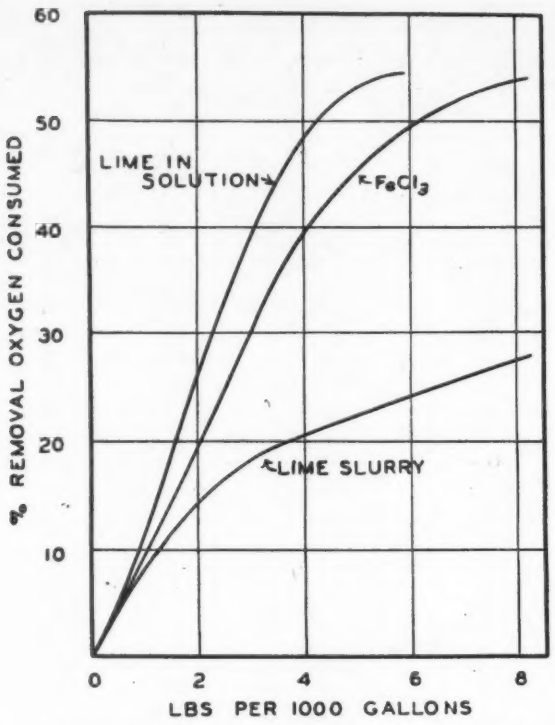


Fig. 1. Removal of oxygen-consuming material. Lime solution and lime slurry as CaO; ferric chloride as $FeCl_3$.

with flash mixing (150 r.p.m.) for 30 seconds, with rapid stirring (70 r.p.m.) for 3 minutes, and slow stirring (15 r.p.m.) for 15 minutes. The manner of stirring is not important, but the chemicals must be well distributed through the liquor to obtain optimum results. Uneven distribution of the chemicals results in poor clarification and low oxygen-consumed removal.

Quantities of Lime and Ferric Chloride

Rapid and equal distribution of dry lime is difficult, producing relatively poor results. The results presented are therefore restricted to lime slurries and saturated lime solutions. Typical results obtained with lime slurry alone, saturated lime solution, and ferric chloride alone are shown in Table I. The pounds of lime are given as CaO and the ferric chloride as $FeCl_3$. The figures illustrate several points:

1. Lime slurry is definitely inferior to lime solution or ferric chloride.
2. Lime solution added in the same quantities as ferric chloride is equal to or better than ferric chloride for oxygen-consumed removal.
3. Lime solution becomes increasingly more effective in clarification and is equal to ferric chloride with additions of 3.3 pounds per 1,000 gallons or over.
4. Lime as a slurry or in solution produces less sludge than ferric chloride.

Combinations of ferric chloride and lime, as a slurry and as a saturated solution, were added in various quantities. The clarification and oxygen-consumed removal results were similar to those recorded for the individual chemicals when the same amounts of coagulants were used. In an effort to determine how far the oxygen-consuming materials could be removed by combination treatment, the approximate optimum quantities of lime required for best clarification and oxygen-consumed removal were supplemented by ferric chloride. Some typical results for lime slurry-ferric chloride and lime solution-ferric chloride are shown in Table II. The additional oxygen-consuming material which can be removed by a combination of lime slurry-ferric chloride treatment amounts to some 15 per cent. The total removal of oxygen-consuming material is greater when saturated lime solution is employed in conjunction with ferric chloride than when lime slurry-ferric chloride is used. However, since a saturated lime solution is more effective in removing oxygen-consuming material from the supernatant liquor than a lime slurry, the addition of ferric chloride is relatively less effective. For example, when 4.95 pounds of CaO were added as a slurry together with 2.10 pounds of $FeCl_3$, the percentage O.C. removal increased from 25 to 40 or 15 per cent. With the same amounts of CaO in solution and $FeCl_3$ the increase in removal was less than 5 per cent. However, the turbidity removal or clarification was greatly increased. This indicates that probably half or more of the total oxygen-consumed value of supernatant liquor is due to soluble substances. The turbidity recorded for lime slurry-ferric chloride treatment consisted in part of lime particles. This type of suspended material does not contribute materially to the oxygen-consumed value and is readily removed by $FeCl_3$, but the additional oxygen-consumed removal is small.

A comparison of removal of oxygen-consuming material by lime or ferric chloride (Fig. 1), brings out clearly the effectiveness of lime if present in an active

TABLE I
Coagulation of Supernatant Liquor

Quantity lbs./1000 gal.	*Sludge volume %*	*pH of effl.*	*O.C. Removed %*	*Turbidity of effl. ppm.*
Lime slurry				
0	1.9	7.30	0	670
1.66	2.0	7.49	12.9	660
3.30	2.6	7.60	18.4	600
4.95	2.9	7.78	18.4	600
6.60	3.7	7.89	23.6	560
8.30	4.1	7.97	27.8	540
Lime solution				
0	2.0	7.61	0	550
0.83	1.7	7.87	1.9	527
1.66	1.6	8.03	13.9	475
2.50	2.7	8.22	19.9	467
3.30	2.5	8.47	38.7	289
4.15	2.2	8.72	50.0	264
4.95	3.6	9.04	54.8	202
Ferric chloride				
0	2.0	7.36	0	584
0.83	2.9	7.25	13.9	432
1.66	5.2	7.14	14.7	328
2.50	7.9	7.06	29.0	296
3.30	9.3	7.00	33.5	288
4.15	10.0	6.96	40.3	264
4.95	10.1	6.88	38.0	240
5.75	11.6	6.82	48.1	168
6.60	12.1	6.74	51.5	142
7.40	13.1	6.70	54.1	128

TABLE II
Coagulation of Supernatant with Lime and Ferric Chloride

Quantity lbs./1000 gal.		*Sludge volume %*	*pH of effl.*	*O.C. Removed %*	*Turbidity of effl. ppm.*
Lime slurry	$FeCl_3$				
8.30	0	4.3	8.10	25.4	600
8.30	0.4	5.4	8.10	30.9	600
8.30	0.83	5.9	8.07	29.4	600
8.30	1.25	6.6	8.08	35.0	590
8.30	1.66	6.8	8.11	40.5	590
8.30	2.10	8.7	7.68	41.5	270
Lime solution	$FeCl_3$				
0	0	1.7	7.52	0	656
4.95	0	3.6	9.04	54.8	202
4.95	0.83	9.4	8.53	60.0	15
4.95	1.66	11.5	8.39	59.0	15
4.95	2.50	13.8	8.21	59.4	15
4.95	3.30	15.4	8.00	62.0	15
4.95	4.15	19.4	7.71	63.0	15

state. When the lime is in solution, its activity at least equals ferric chloride as a coagulant in supernatant liquor treatment. The objection is that the solubility of lime is low and relatively large amounts of water must be used.

Using lime in conjunction with ferric chloride for removal of oxygen-consuming materials and sludge volume produced (Fig. 2) shows that:

1. Five pounds of lime (CaO) in solution plus 1 pound $FeCl_3$ is better than 8 pounds of lime (CaO) as a slurry plus 4 pounds of $FeCl_3$.
2. Lime in solution is the effective agent, hence adding larger quantities of lime slurry is not more effective and does not save appreciable quantities of $FeCl_3$.
3. The volume of sludge produced with lime solution and ferric chloride is about twice as much as with lime slurry and equal quantities of $FeCl_3$.

The increase in sludge produced by lime in solution and ferric chloride appears to be caused by the greater removal of finely divided material resulting in the formation of a small floc. The floc settles rapidly but is not weighted down by inert lime present in a lime slurry. Comparison of sludge production with lime in solution alone and ferric chloride alone, indicates that the larger volume of sludge is primarily due to the ferric chloride. In effect, the smallest volume of sludge is produced when lime solution alone is used.

To determine the effect of smaller quantities of saturated lime solution used in conjunction with $FeCl_3$ a number of experiments were made, and typical results are illustrated in Fig. 3. It is evident that, with smaller quantities of lime in solution, a considerable reduction in ferric chloride can be accomplished. This is the same as saying that the additional removal of oxygen-consuming material by a given amount of ferric chloride in conjunction with lime, over lime alone, decreases with increased amounts of lime. It appears, therefore, that with a very thin lime slurry the same can be accomplished as with a heavier slurry, because the lime in solution is the effective material. If larger volumes of water are of no importance, the lime solution made by running a constant stream of water through a container with hydrated lime slurry appears most practical.

The experiments recorded pertain to the use of so-called high-calcium hydrate. Experiments with dolomitic or high-magnesium hydrates shows that clarification and oxygen-consumed removal are less when used on equal quantities. Pending further investigation, calcium hydrate is believed best for this purpose.

The volume of water required for saturated lime solution varies with the quantities of lime used. The quantities of water necessary to produce a clear supernatant and remove 50 per cent of the oxygen-consuming materials from the digester liquors used in the experiments and cost of the chemicals were calculated. The cost of chemicals was arbitrarily chosen to be $80 a ton for ferric chloride and $12 a ton for hydrated lime. A few combinations of chemicals, the water required, the sludge formed and cost of treating 1,000 gallons supernatant digester liquor are given in Table III. When the data are plotted it is clear that there are certain definite relations between the amounts of water used and sludge formed, while the cost decreased with the increase in amount of lime used (Fig. 4). The more the amount of lime in solution, the lower the sludge formation and the lower the cost.

TABLE III

Chemicals and Volumes of Water Required to Produce Clear Supernatant and 50% O.C. Reduction and Cost of Chemicals per 1,000 gallons supernatant

Chemicals lbs.		*Volume of Water, gals.*	*Sludge %*	*Cost* Cents*
$FeCl_3$	CaO			
6.32	0	0	16.0	25.2
4.70	1.66	200	14.0	20.2
2.20	3.30	500	5.4	13.5
0	4.15	714	1.2	3.5

*Ferric chloride at 4c per lb.; hydrated lime at $12.00 a ton.

Summary

Experiments conducted to determine the effect of lime slurry and of lime in solution, either alone or in conjunction with ferric chloride, on the clarification and removal of oxygen-consuming material from digester supernatant liquor show that:

1. Most efficient clarification could be accomplished by lime in solution in conjunction with $FeCl_3$.
2. It was difficult to remove more than 60 per cent of the oxygen-demanding material with lime alone or lime in conjunction with $FeCl_3$.
3. Lime in solution was as effective as ferric chloride and more effective than lime slurry in clarification and removal of oxygen-consuming materials.
4. The volume of water required as lime solution for optimum results amounted to about ¾ of the volume of supernatant liquor.
5. Combinations of lime solution or lime slurry and ferric chloride can be used for the purpose.
6. Sludge formation was lowest with lime in solution and highest with ferric chloride.
7. For equal clarification and removal of oxygen-demanding materials lime in solution is lowest in cost.

The above, written for PUBLIC WORKS, is the third Journal Series Paper of the New Jersey Agricultural Experiment Station, Rutgers University, Dept. of Water and Sewage Research, New Brunswick. N. J., dealing with the use of lime in sewage treatment.

The work recorded in this paper was performed under a Fellowship grant of the National Lime Association.

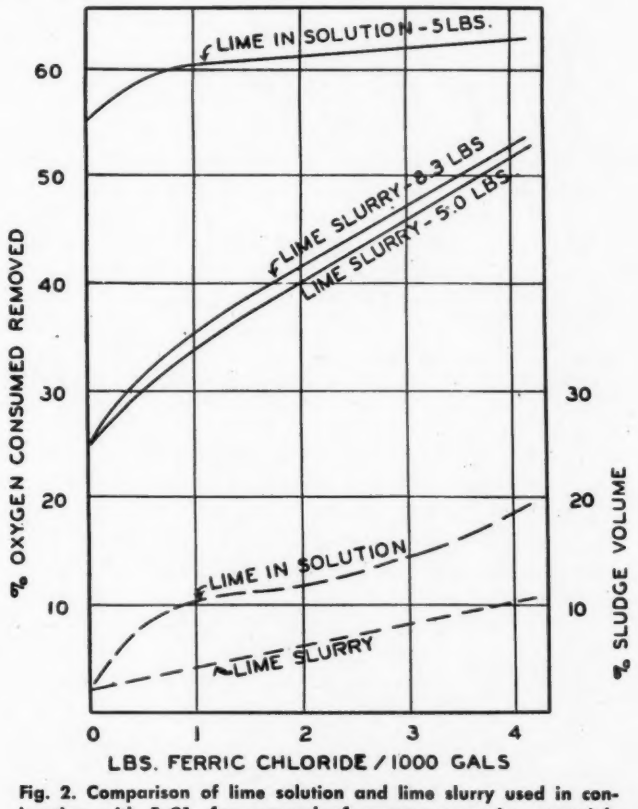
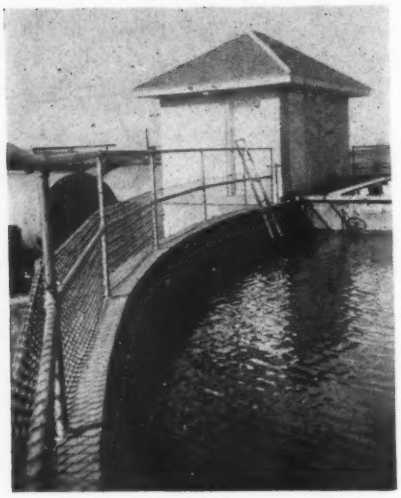


Fig. 2. Comparison of lime solution and lime slurry used in conjunction with $FeCl_3$ for removal of oxygen-consuming materials and sludge production.



Head house and mixing chamber.

Fifty-three Yea eve

By CHARLES W. MILLER
Superintendent

THE plant providing water to Butler, Missouri, has been a gradual growth from 1889 to the latest improvements in 1942, as necessity arose for increasing the quantity available and later for improving the quality, the water being high in turbidity and color and varying widely in hardness and pH.

The original plant, installed by a private water company in 1889, consisted of two 500 gpm steam pumps located at a dam across a small stream four miles west of Butler, which pumped river water into a small basin for settling (using alum for coagulation), and from the basin to a water tower 100 ft. high in town. (This tower is still being used.)

In 1915 the city voted bonds to purchase this plant, acquire necessary land, and build a power plant (diesel engines and generators) that would furnish current for commercial lighting and power as well as for operating the water plant. At this time a combined coagulating and settling basin and filters were installed, the former being kept filled to a height sufficient to cause the water to flow by gravity to the filters. Also a clear well was built, which was found to be too small to prevent a water shortage should there be any difficulty in plant operation.

In 1926 the plant was given a major remodelling. A circular tank was built of 1,000,000 gal. capacity, with vertical sides; also a 100,000 gal. coagulating basin was built at the new plant, inside of which was constructed a spiral wall to provide a longer settling period. In addition, a pump of 350 gpm capacity against 15 ft. head was installed to pump raw water from the new tank to the treatment plant; or it could pump into either the new basin or the small coagulating basin built in 1915. The solution chemical tanks were replaced with dry chemical feeders at this time.

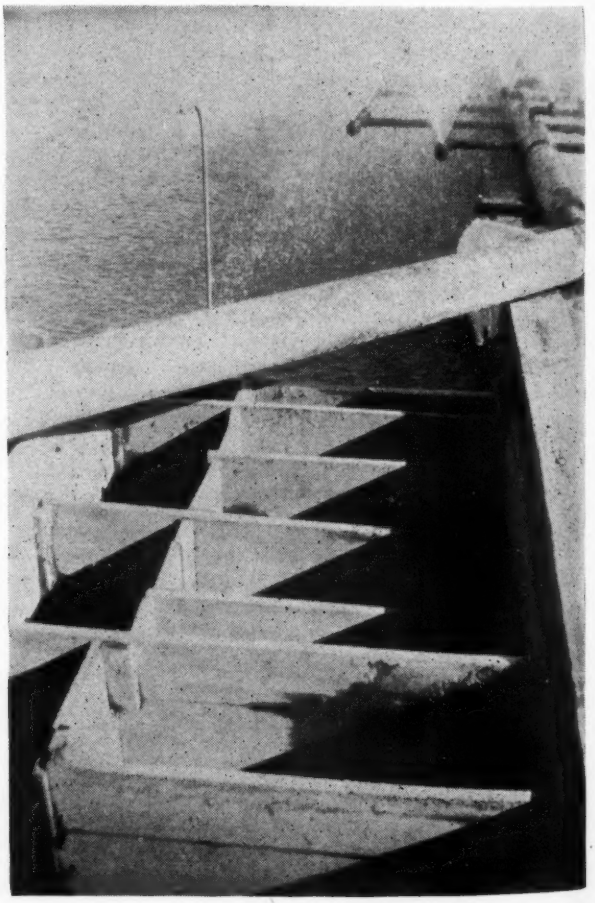
In 1927, to comply with State Board of Health requirements, the city purchased a type MSA W&T chlorinator, wall model; which was replaced in 1929 with a MSP pedestal model.

In 1928 a Vogt air-mix was installed in the small coagulating basin, which the water had formerly entered at the center and, flowing in a spiral course, had left over a weir outlet.

After several experiences of water shortage, a new dam was built in 1938 on a watershed a few miles west of the old dam. In 1939 this new dam held in storage a huge volume of water; which is held as a reserve, the regular supply still being obtained from the first source, which is ample in ordinary times.

Just prior to the latest improvements in 1942 the purification plant included two rapid-sand filters, with head gauges, flow controllers, and an automatic transfer pump control which also controlled the chemical feeders at the secondary basin. There were two chlorinators, one on the secondary basin and one for final chlorination of the filtered water before it entered the clear well.

After much time had been spent in experimenting with different feeds and different chemicals, it was decided in 1942 to make a radical change, and use the large basin for coagulating and the smaller one for



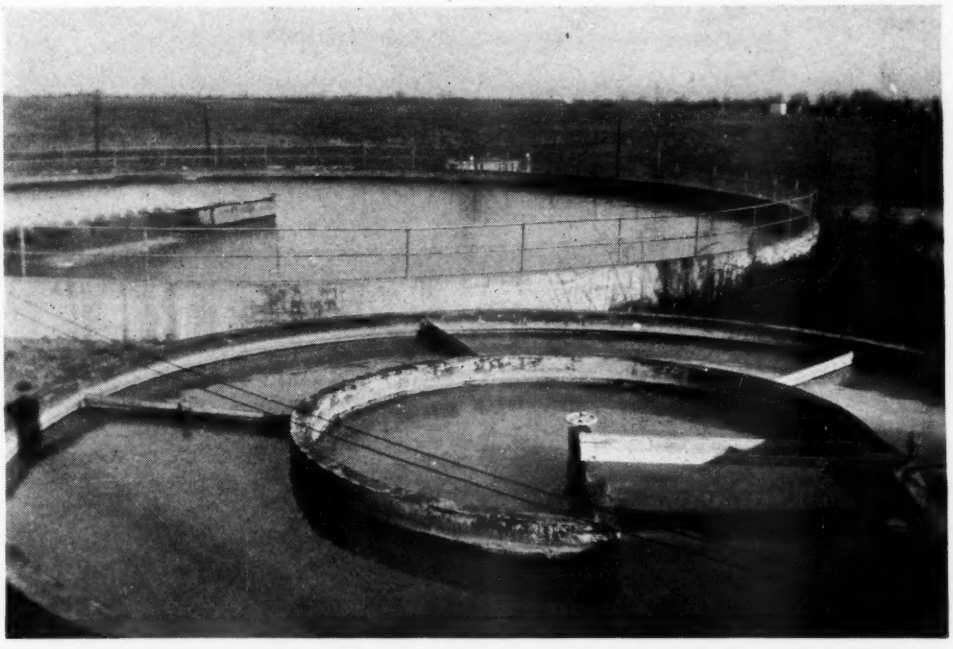
Vertical flumes in mixing chamber. Air sprayers in background.

evelopment of a Missouri Water Plant

Growth from a simple settling tank and two steam pumps to a modern plant with five motor-driven pumps and a softening and filtration plant with chlorination.

softening. This permitted coagulating at a low pH, and softening it when desired.

In making this change, a mixing chamber was constructed just inside the 1,000,000 gal. basin; and adjacent to this, just outside the basin wall, a head house containing two chemical machines. The mixing chamber, which is 4 ft. wide, 9 ft. long and 12 ft. deep, receives water from the raw water main and mixes it with chemicals from the head house; the mixing being effected by a number of vertical flumes so connected as to cause the water to pass through them all, from one to the next in succession, giving the same water detention period as would a single long flume.



Foreground—100,000 gal. basin used for softening. Background—1,000,000 gal. basin built in 1926. Note the spiral wall in the smaller coagulating basin, to provide a longer settling channel.

This arrangement made it possible to feed sulphate of alumina at the intake to the mixing chamber, and also to feed lime when desirable. (However, most of the time only sulphate of alumina is used, which removes the turbidity and most of the color.) The secondary basin, with the two chemical machines, affords a means of supplying a small amount of coagulant, and any lime needed to adjust the pH, or to hold the hardness below 90 ppm by softening.

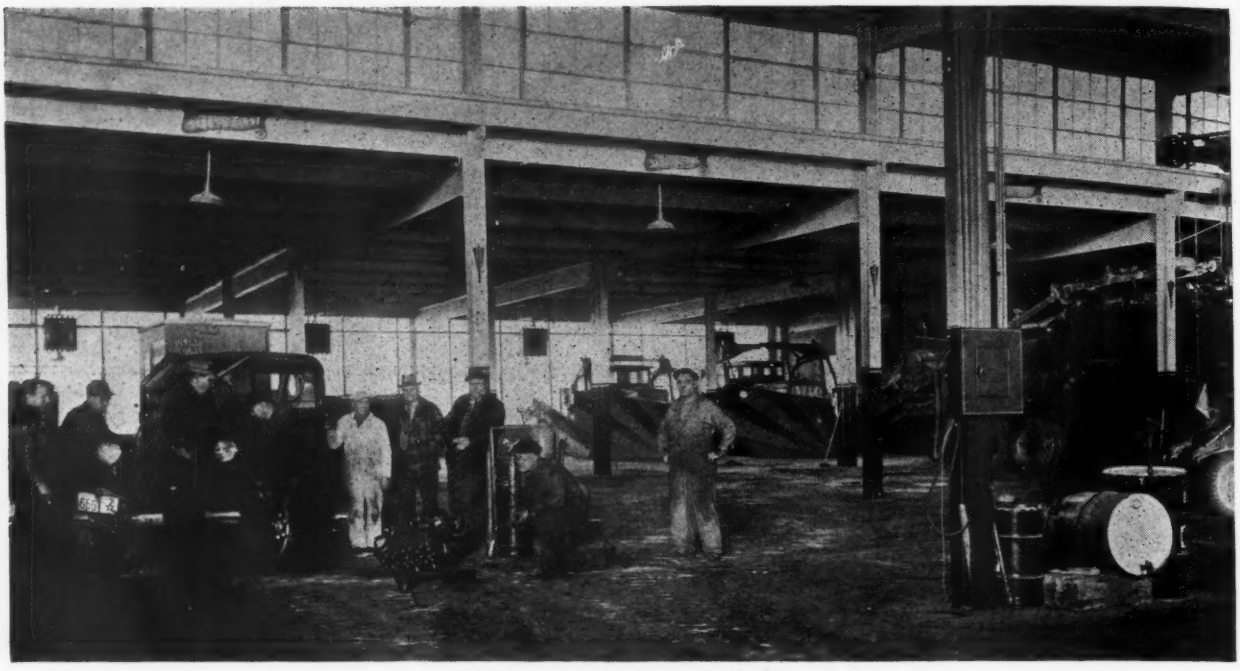
The generating units of the power plant circulate raw water through their heat exchangers, and this is then cooled and aerated by spraying it into the raw water basin.

Automatic control of the transfer pump and chemical machines is provided by a float switch in the filters, which starts the lime feeder whenever the transfer pump starts. Automatic control of the water level in the clear well is obtained by means of a float attached to a Simplex rate controller, starting and stopping this as the water falls or rises to predetermined points.

The plant is equipped with a small laboratory, where daily tests are made on the raw and finished water; the tests made in this laboratory including those for bacterial content, alkalinity, hardness, chlorine, pH and turbidity.

All power used to drive the pumps and other machines is generated in the same building that houses the water plant.

The principal equipment of the water plant is as follows: Two 350 gpm pumps, 250 ft. head, one Fairbanks-Morse, one Dayton-Dowd, with 75 hp motors. Two 500 gpm Allis Chalmers pumps, 150 ft. head, 40 hp motors. One 350 gpm Dayton-Dowd pump, 15 ft. head. Two W&T class M feeders for lime and alum. Two W&T chlorinators. Two Pittsburgh rapid sand filters, 250,000 gpm capacity. Two Simplex head gauges. One Simplex rate-of-flow controller. One National 4 in. raw-water meter. Two Omega chemical feeders. Three American platform scales. Also the automatic controls and other minor equipment.



Interior view of Oconto County shop.

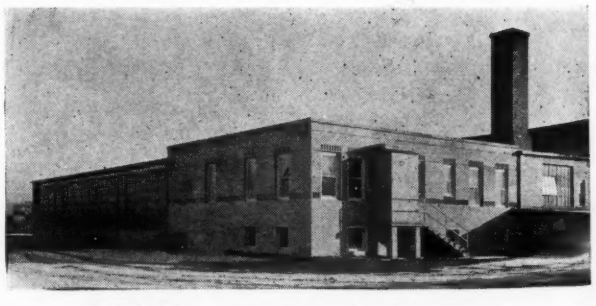
Oconto County's Modern, Well Equippeigh

By C. L. FOLEY
Highway Commissioner

A WELL equipped highway shop and adequate storage space are very essential to the proper maintenance and operation of equipment. Our county shop was planned and constructed so the main office and stock room would be in the same building where the equipment is repaired and also have the supplies and records of such repairs available in the same building. This arrangement enables us to keep a very definite check on repair parts, supplies and labor necessary to make equipment repairs.

The cost of repairs and actual operation of each unit is kept separately and we definitely know from our monthly and annual reports whether or not a unit of equipment is operating efficiently and economically.

The list of shop equipment is as follows: Hydraulic press, Boomer & Boschert; Hydraulic press, shop made; Exhaust analyzer, Engelhard; Spark plug cleaner, A. C.; Piston vise, shop made; Electric drill, Van Dorn; Electric drill, Sibley; Electric welder, Miller; Electric welder, Lincoln; Acetylene torch, Smith; Acetylene torch, Air Co.; Power sickle grinder, shop made; Iron shears, Plymouth; Power drill ¼" to 1¾", Sibley; Threading machine, Wiley & Russel; Pipe vise, shop made; 14" power grinder, Atkins; Power hammer, Mayer; Shop crane, Chisholm & Moore; Electric drill, Black & Decker; Hand grinder, Black & Decker; 6 Bench vises, Black & Decker; Lathe and equipment, Mueller; Shaper and equipment,

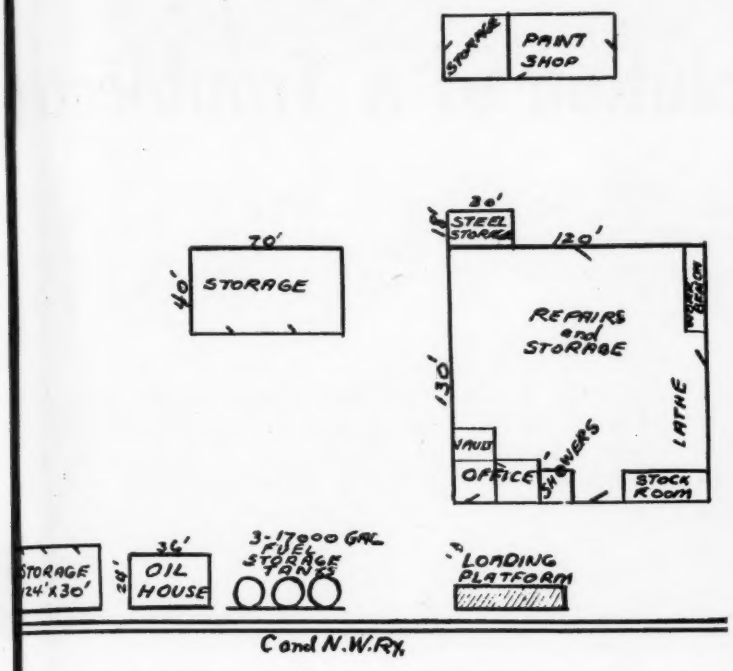


Office building and north end of highway shop.

Gould & Eberhardt; Power hack saw, Racine; Tool press, Manley; Power grinder, Marathon; Lathe grinder, shop made; Hand press, Greenerd; Air Compress, USS; Boring machine, Quickway; Magneto tester, shop made; Condenser tester, Niehoff; Valve refacer, Sioux; Valve seat grinder, Hall; Wrist pin hone, Sunnen; Electric drill, Canedy & Otto.

The floor plan will show about the way the equipment is arranged.

The main building, except the office portion, is of reinforced concrete and steel sash design. The office portion is entirely reinforced concrete. The balance of the buildings are of brick and corrugated metal design with concrete floors. All buildings are well



Floor plan of Oconto County shop and storage space.

C. L. Foley, Highway Commissioner.

peighway Shop

A shop well equipped and with a personnel of nine very efficient men keeps 87 pieces of equipment in excellent condition, and complete records tell economy of operation.

ventilated. Under the office and shower bath portion of the main building, we have a reinforced concrete basement for the heating plant and club room for the employees. The club room is used considerable in the winter season by snow plow crews, between twelve-hour shifts, during snow storms.

We have a well trained and very efficient shop personnel as follows: Chief mechanic, stock room clerk, 3 mechanics, blacksmith and welder, painter, gas truck operator, and night watchman and janitor.

The above nine men keep the buildings clean and the following 87 pieces of equipment in excellent condition: Nine 1½-ton Ford dump trucks; two 3-ton trucks (White and Reo); nine 5-7½-ton trucks (Oshkosh and F.W.D.); two 10-ton F.W.D. trucks; one 20 hp Caterpillar tractor; one 30 hp Cat.; one R.D. 7 Cat.; three L. O. Allis Chalmers tractors; twenty-four snow plows (La Plant-Choate, Wausau, Adams, Cat., 5-7½ and 10-ton Wisconsin); fifteen graders (Caterpillar, Adams, International Harvester); one 20-ton La Crosse trailer; three 6-7 cu. yd. Continental scrapers; one 1-bag Koehring concrete mixer; one truck-mounted 220 cu. ft. Sullivan air compressor; one 24" x 36" Pioneer gravel plant complete; one ½ cu. yd. Northwest gas shovel; one tank car heater; eight La Crosse sanders; one 800 gal. Kinney distributor; one 1200 gal. Austin-Western distributor; and one 7-10 ton Var. Galion roller.

Eight truck plows and 2 tractor plows in front of Oconto County's shops.

Screening, the Solution of a Troublesome Trade

By ARTHUR L. BOLEY
City Engineer, Sheboygan, Wisconsin

EVER since 1936, when Sheboygan's sewage treatment plant (a separate sludge digestion type) was completed, considerable operating troubles were encountered, especially from the trade wastes contributed by a large tannery of the Armour Leather Co. The difficulties were caused not only by the large amounts of "hard to treat" solids reaching the treatment plant, but also by the quantity of lime in solution in the waste which acted as a coagulant. This caused some of the suspended solids to precipitate in the interceptors during the periods of low flow, particularly on Saturdays and Sundays; and Mondays, with the increased flow and higher velocity in the interceptor, this accumulated settled material was carried to the plant, greatly increasing the solids load, and caused trouble because of the great fluctuation in operating load.

After several meetings of municipal and tannery representatives, it was agreed that the most feasible solution of the problem was the construction of a separate screening plant at the tannery, together with the necessary collecting sewers to separate the trade wastes from the strictly sanitary sewage, storm water, cooling water, etc., and carry them to the screening plant. It was also necessary to construct a portion of a proposed future sanitary sewer system to carry the screened sewage to the interceptor.

It was agreed that the city would construct the screening plant and collecting sewers and turn them over to the tannery to operate, maintain and dispose of the screenings. The cost of the installation to the city was $29,000 for the plant and connecting sewers and $6,000 for the outfall sewer. The entire work was designed by and constructed under the supervision of the City Engineering Department.

The design was based on a flow of 2.0 mgd concentrated in a 6-hr. period. This will allow for some increase in the tannery production and provides for peak flows during the time that large vats are emptied. The sewers were designed to carry this flow at a minimum velocity of four feet per second to reduce the tendency of precipitation of some solids and the stranding of others.

The site selected for the screening plant had been an old creek-bed and the top forty feet was swamp muck which had little or no load-bearing value. To insure against unequal settlement in the structure, the foundation side walls were designed as deep continuous beams supported on concrete piles. These concrete piles were 16″ x 16″ in cross-section and 30 to 37 feet in length, and were designed to carry a load of 100,000 lbs. each.

The screening equipment selected was an 8 ft. diameter by 8 ft. long Dorrco sewage screen with ⅛ inch diameter openings. A Dorrco bucket elevator carries the screenings to an overhead hopper which has a capacity of 1¼ cubic yards and is mounted high enough to allow a truck to drive under it. The bottom opening device consists of duplex under-cut gates manually operated.

The building is heated and ventilated by means of a unit heater with a manually controlled fresh air intake and a motor-driven exhaust fan ventilator. The system was designed to provide for four complete air changes per hour to eliminate condensation of the moisture in the air and to reduce the odor nuisance.

The plans show the general arrangement of the equipment and the construction of the building. The brick was selected to conform to the other tannery buildings.

The plant was put into operation in May, 1942, and the amount of screenings removed by the coarse

One Year Operation Without Screen
1941-1942

Month	*M. G. Sewage*	**Dry Solids*
May	207.45	555,642
June	186.17	511,807
July	182.54	511,579
August	155.00	469,424
September	184.03	460.357
October	237.58	566.426
November	208.28	529,879
December	186.58	560,376
January	196.52	564,081
February	166.98	547,765
March	226.08	639,096
April	180.88	491,137
Total	2314.09	6407,569
Average per day	6.34	
*Dry Solids per M. G.		2770

One Year Operation With Screen
1942-1943

Month	*M. G. Sewage*	**Dry Solids*
May	207.65	394,279
June	268.88	482,969
July	264.00	519,281
August	244.25	516,129
September	212.18	468,544
October	183.65	507,113
November	174.28	480,000
December	183.50	494,383
January	183.35	494,185
February	199.02	437,999
March	253.10	546,617
April	266.88	607,059
Total	2640.74	5948,558
Average per day	7.24	
*Dry Solids per M. G.		2250

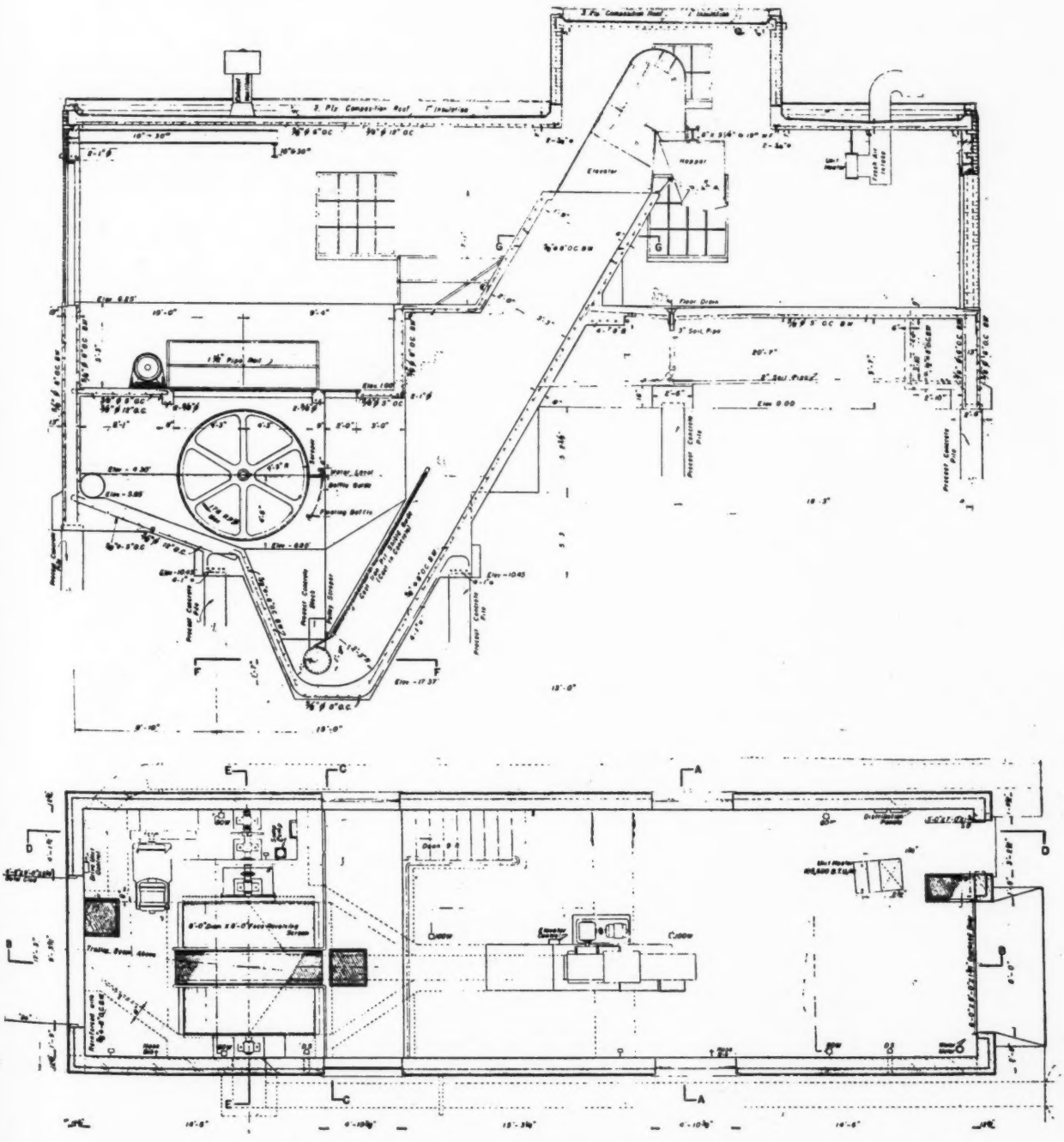
ade Waste Problem

By constructing a screening plant at a tannery, removing a large part of the hair and lime in the tannery waste, Sheboygan greatly decreased troubles at its sewage treatment plant.

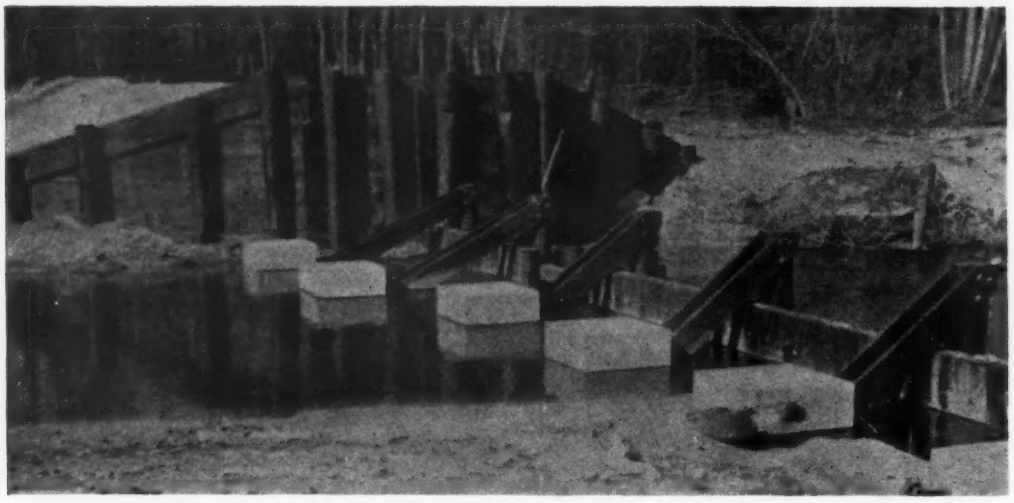
screen at the treatment plant dropped from about 1½ cubic yards per day to less than ½ cubic yard per week.

The comparative data shown in the two tables on page 20 are taken from the monthly report of the superintendent of the sewage treatment plant, showing the dry solids per mg with and without screening.

(Continued on page 26)



Floor plan and vertical section of Sheboygan sewage screening plant.



One end of spillway of dam built of creosoted lumber.

Creosoted Wood Dam for Water Supply

Details of construction of a low earth dam with a wood core wall and a 150-foot spillway of wood sheet piling, a stilling chamber and flume, all of creosoted timber.

A DAM composed of cresoted lumber and piles was installed as a part of the water supply system for a project recently completed in a southern State. The source of supply was a creek which had a watershed area covered principally by pine forests and possessed a fairly steady volume of discharge and normally carried only a small quantity of sand and silt as sediment. A low-level dam was constructed to maintain a minimum ponding level sufficient to insure a constant flow by gravity down the intake conduit to the purification works.

The site selected for the dam had been the site in early days of a dam built for a log mill pond, and some remnants of the original construction were exposed during excavations for the new work.

The spillway section of the new dam is about 150 ft. long. It extends across the principal channel of the stream and is tied at each end into an abutment and wing-walls of cresoted piles and lumber. Earthen embankments, containing a core of cresoted Wakefield sheet piles, also project for several hundred feet from each end of the spillway to form a dam across the remainder of the valley inundated by the creek at flood stage. The spillway of the dam is likewise composed of Wakefield sheet piling. The sheet piling in the spillway and the embankments consists of three layers of 2 x 12-in. dressed plank and was driven to a depth of 3 ft. into a bed of blue clay which was found several feet below stream bed. The barrier created by the sheet piling acts to shut off seepage and underflow through the sandy deposits above the blue clay stratum as well as the direct flow on the surface.

The cut-off level of the sheet piling in the earthen embankments is about 7 ft. above the spillway crest which, in turn, is 7 ft. above the stream bed.

The sheet piling in the spillway is supported horizontally at the ground line and at the top by means of 8 x 8-in. timber wales, carried by two rows of round wood piles driven at 10 ft. centers on each side of the spillway. The upstream row of piles was cut off several feet below the second row, the tops of each pair were tied together by diagonal bracing, and a concrete block was cast in place on the top of each upstream pile. These blocks are of sufficient weight to resist overturning of the structure. A stilling chamber, also of treated timber, was constructed beside the entire downstream face of the weir to dissipate the energy of the water falling over the spillway and thus prevent erosion of the downstream channel. The stilling box is supported by the second row of piles, on the downstream side of the weir, and by a third row driven along the outer edge of the box. The stilling box or chamber is 3 ft. deep, 6 ft. wide across the shallower part of the stream, increased to 8 ft. across the main channel.

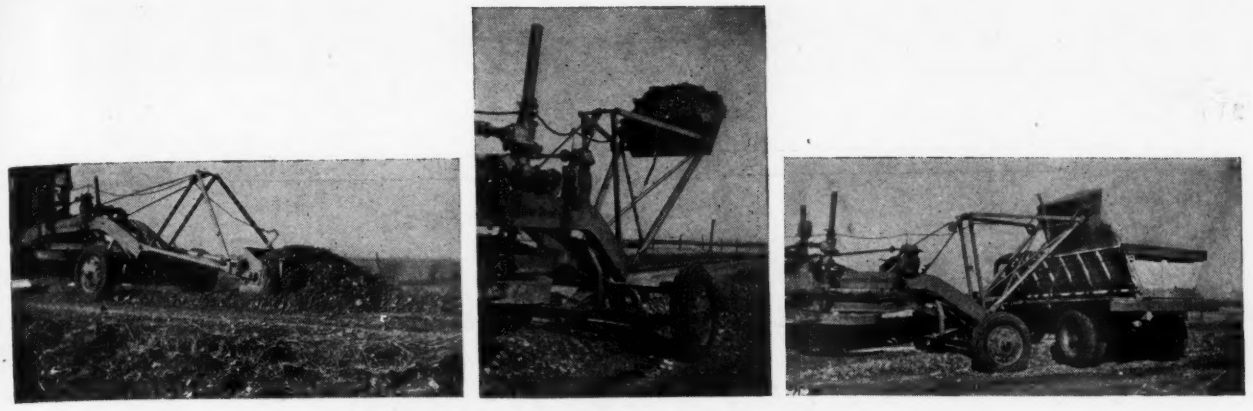
A wooden flume extends above the dam to divert and convey water from the stream to a grit removal chamber and sump. The flume is also built of lumber and supported by round piles in pairs at 10 ft. centers.

Teco connectors 2½ in. in diameter were used in all bolted connections between round piles and support timbers and wales. All round piles had a minimum diameter of 12 in. at the butt and were driven at least 15 ft. into the underlying blue clay.

All round piles, sheet piling and lumber were pressure treated with coal-tar creosote by an empty-cell process with a final retention of 10 lbs. per cubic foot of wood. The only exception to this was the lumber in the intake flume, which is untreated cypress. All timber was cut and framed as far as practicable prior to treatment, and all necessary field cuts were given three applications of hot creosote.

The resident engineer on this work was Tom D. Samuel III. The installation was designed by Black & Veatch, consulting engineers, of Kansas City, Missouri.

The above article is reproduced by the courtesy of "Wood Preserving News."



The loader that Marion County made from a Caterpillar patrol.

How Marion County, Kans., Beats the Labor Shortage

The department, in its own shop, and using material from its scrap pile, made its Caterpillar patrol into a loader to take the place of a dozen men with hand shovels.

By JAMES F. MEISNER
County Engineer, Marion Co., Kans.

THE honeymoon is over. The young bride (WPA) has gone and left the groom (County Highway Dept.) to try to bring order out of the wrecked union. And what a job! For while the bride was here she had grandiose ideas for improving the old homestead and many of them were carried out, many started but not finished, many finished with no thought of the cost of maintenance. It was glorious while it lasted.

But—the bubble burst. The bride, more attractive than ever, has gone. And she has taken with her our hired hands; she ran us into debt, spoiled our help, expanded our operations, gave us an appetite for the more abundant life. Now we are left alone to work out the problems she created, to carry on the work she started, with no help, no cash, and no critical materials —only our rugged individualism and our American will to do the job regardless of obstacles.

And that is why the Marion County Highway Department is making its No. 10 Caterpillar Diesel patrol not only maintain its roads as a patrol but also is making it take over the duties of a dozen men with shovels.

In order properly to maintain our rock surface roads, we found it necessary to equalize the windrows of rock on the road, and to load surfacing material from stock piles, gravel bars and sand pits for patching. We had the material and trucks and patrols but we could find no labor to load.

Our shop is equipped with only an electric welder, gas welder and cutter, upright grinder and a drill press with very few large bits. But our shop men, Rudy Thye and Haze Meierhoff, are master mechanics; also they have the American spirit; so we built a loader.

We derived our power for lifting from the control box of the patrol—the gear used to control the snow plow. We carried this power onto an old Russell grader worm blade lifting gear. From this gear we built a cable drum, using plate steel and a section of 5-inch oil field casing, and thus we completed the lift part of our loader.

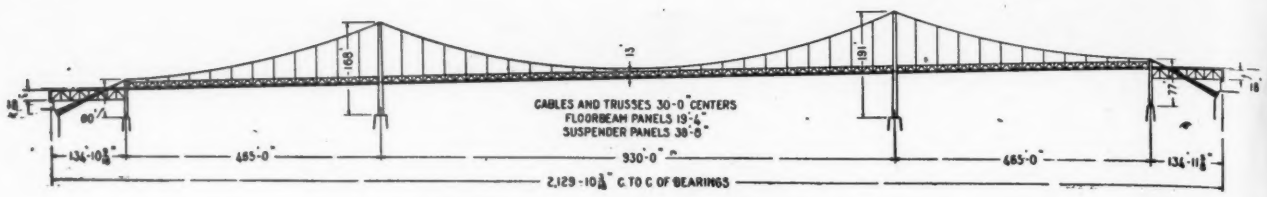
We raided our scrap pile and the junk yards where we found: 3-inch oil field pipes for the arms, strap iron for our tension member, 1½-inch pipe for our bracing, and assorted straps and plates for ties, hooks and levers. We even found an old wheel scraper bowl for the bucket. Everything we used came from some scrap heap. The loader is attached on the brackets provided on the patrol for the snow plow connection.

This loader weighs 760 pounds and cost Marion County $236.15 of which $166.63 is shop labor, $36.92 is shop welding, $5.00 is for the bucket, $5.80 for outside lathe and machine work and $21.80 for junk iron and pipe.

The pictures show the loader in action. It is loaded in either second or low gear, depending upon the firmness of the material. A four-yard truck bed can be filled with five or six bucket loads. The truck is usually spotted ahead of the loader or shuttled back and forth in its line of travel.

The disadvantage of the outfit is its awkwardness in tight places, due to long wheel base and its inability to work except on smooth surfaces; but for anyone who has stock pile loading or windrow shifting, or solid footing gravel pits, this loader is a labor and money saver.

We have used our cutter and welder to help us out of several holes—make a guy line derrick for pile drivers, a hoist for pile driving, and various repair parts for equipment; our latest is a loading equipment for a 20 Cat. to get down in river gravel bars.



Elevation of Peace River suspension bridge.

Building the Peace River Suspension Bridge in Sub-Zero Weather

To carry the Alaska Highway over Peace River, Public Roads Administration built a 930-foot span suspension bridge in sub-zero weather, erecting the towers entirely from the ice in the river.

By RAYMOND ARCHIBALD

Principal Structural Engineer, Public Roads Administration, Federal Works Agency

ONE of the first major problems which confronted the Public Roads Administration in assisting Army engineers in constructing the Alaska Highway was the spanning of Peace river, near Taylor Flats in British Columbia. This crossing is about 37 miles north from Dawson Creek, which is the rail head and southern terminus of the Alaska Highway, therefore all supplies and equipment destined for the north over the highway had to cross here.

The ice at this particular place attains a thickness of 4 feet, and when it "goes out," pieces as large as 700 by 2,000 feet break loose and start down the river. The stream was bridged last year by a temporary timber trestle, but to keep such a bridge in operation it would have to be replaced as many as three or four times in a year. Conditions necessitated a rush job on the permanent bridge.

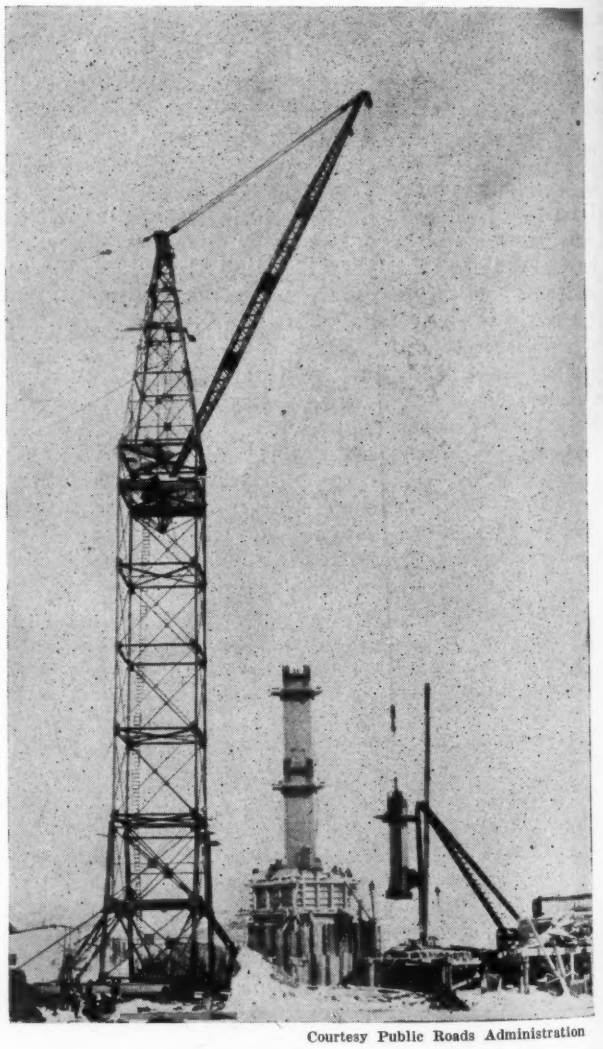
Due to these ice conditions and the deep foundations necessary, it was decided to place a single span across the main channel. A suspension bridge with a main span of 930 feet with loaded back stay spans of 465 feet, was selected as best suited for erection conditions. Falsework was out of the question. Two deck truss spans of 135 feet were interposed between the cable bents and the anchorages. The concrete slab roadway is to be 24 feet from curb to curb. Curbs are to be 18 inches high.

The deck structure is to be suspended from two open-type parallel strand cables. Each cable consists of twenty 2 1/16 inch strands, spaced approximately 4 inches from center to center, and held in position by the cable clamps at each hanger and at the saddles.

Construction of the foundations was started early in December and was carried on throughout the severe winter weather by the Dufferin Paving Company of Toronto, Canada. Intensive efforts were made to complete the two main piers in the river bed so that the steel towers might be erected before the spring breakup of ice.

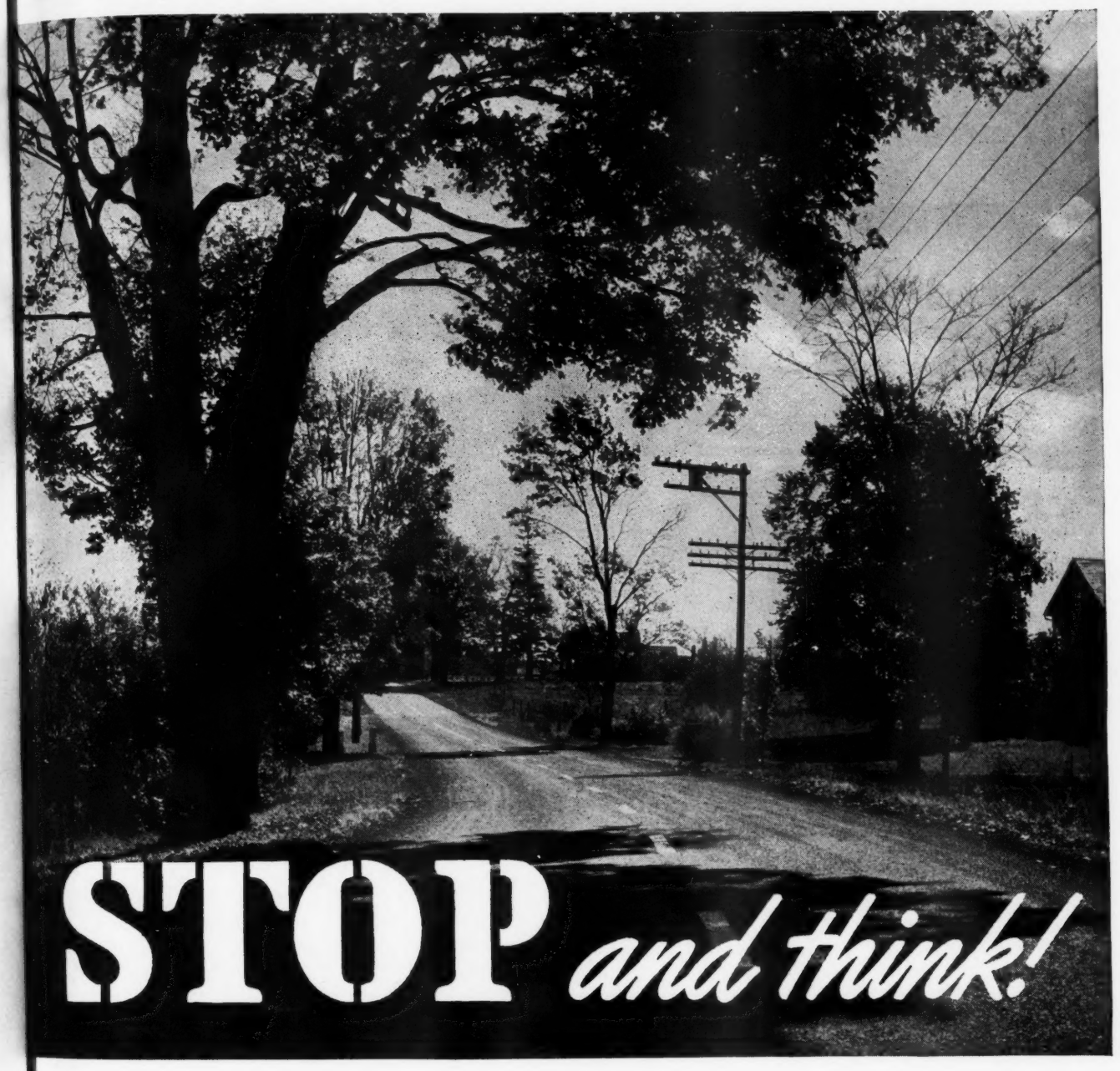
Excavation for the main piers was carried approximately 50 feet below water level into a shale formation. Steel sheet piling was used in the cofferdams and the concrete was placed in the dry. Work was carried on simultaneously on both sides of the river with two complete outfits. Each main pier contains about 4,000 cubic yards of concrete. As concreting was carried on at temperatures as low as —40° F., the aggregates were preheated and the necessary precautions taken to protect the concrete after it was placed in the forms.

The concreting of the anchorages was coordinated



Courtesy Public Roads Administration

Erecting one of the bridge towers. All work was done on the ice.



STOP *and think!*

DESPITE gasoline rationing and rubber shortages, America's roads are actually wearing out faster today than in peacetime!

This is an urgent problem, needing immediate thought and action. With truck traffic up more than 40 per cent, with 4,500,000 trucks carrying raw materials and finished goods, and with workers traveling to and from their jobs, MAINTENANCE is the watchword of the hour.

America's unmatched highway system is the nation's busiest assembly line—essential for the swift transportation of vital military supplies, war workers and farm produce. Now more than ever before, it must be kept functioning at full capacity.

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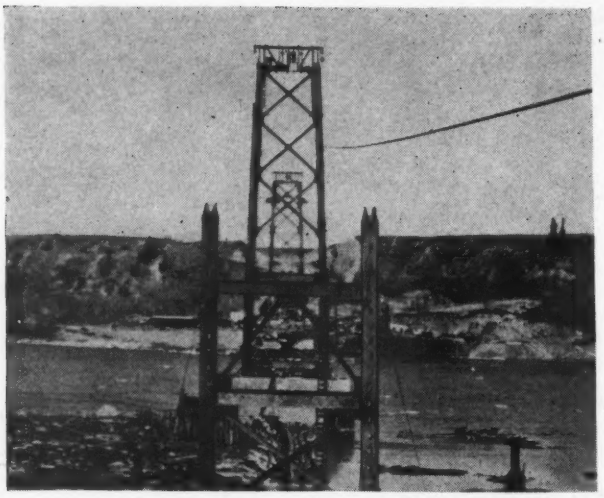
When you need special information—consult the classified READER'S SERVICE DEPT., *pages 55-57*



Courtesy Public Roads Administration

South cable-bent tower in foreground. River free of ice.

so as to have the cable anchorage steel in place by the time the cables were strung. Each anchorage contains about 7,500 cubic yards of concrete so placed as to form cells that were filled with gravel. Large segmented blocks of concrete, keyed and interlocked, were poured.

The contract for furnishing and erecting the superstructure steel was placed the latter part of November, 1942, with John A. Roebling's Sons Company of Trenton, N. J., by the Public Roads Administration.

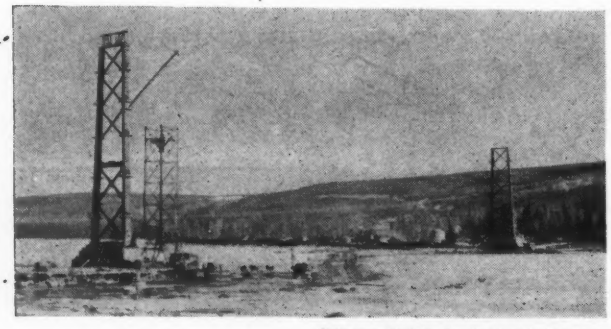
It was decided to work on the ice in erecting the main towers. This meant that the bridge towers had to be erected and the erection tower dismantled by early April when the "break-up" could be expected. An erection tower, formerly used on a barge, was rigged up to operate on skids on the ice.

The erection tower had a reach of 250 feet, sufficient to reach the top of the highest tower, which is 196 feet above the top of the pier. The erection tower was guyed back and, as it could not swing a load, it was "spotted" in front of the legs of the tower by skidding on the ice.

All operations in tower erection were conducted from the ice. After completing the south tower, the rig was skidded across the river on the ice into position for the north tower.

Although there were several delays, the towers were put up in record time and just in time to avoid disaster. The south tower was erected in three and a half days while the higher tower was completed in four days, on April 9. The ice "went out" on April 13 to 15 but not until after the erection tower had been dismantled.

The design and construction of this bridge was under the direct supervision of the U. S. Public Roads Administration. The cost of the bridge will be in the neighborhood of one and a half million dollars.



Courtesy Public Roads Administration

Dismantling erection tower just ahead of ice breakup.

Screening, The Solution of a Troublesome Trade Waste Problem

(Continued from page 21)

From the above it may be seen that the solids pumped to the digesters decreased from 2770 pounds per million gallons to 2250 pounds, a decrease of nearly 19%. While the amount of sewage has increased from an average of 6.34 to 7.24 mgd, an increase of over 14%, and the tannery has increased its output, nevertheless the actual amount of solids treated has been reduced nearly 460,000 pounds in the year's operation.

In addition to cutting down the amount of solids and greatly reducing the fluctuation in amount, the screening plant has removed a large part of the hair and lime in the tannery waste, which has made the sludge easier to handle in the digesters, has decreased the caking on the heating coils and has decreased the hair blanket forming in the digesters.

The operating costs of the tannery have increased somewhat but the results are worth more than the increased cost. The friendly relation existing between the industry and the municipality are worth more than the cost of the screening plant. While the savings in dollars and cents in the cost of operation of the sewage treatment plant are difficult to figure, there has been a distinct improvement in the operating conditions at the treatment plant.

Public Works Programs

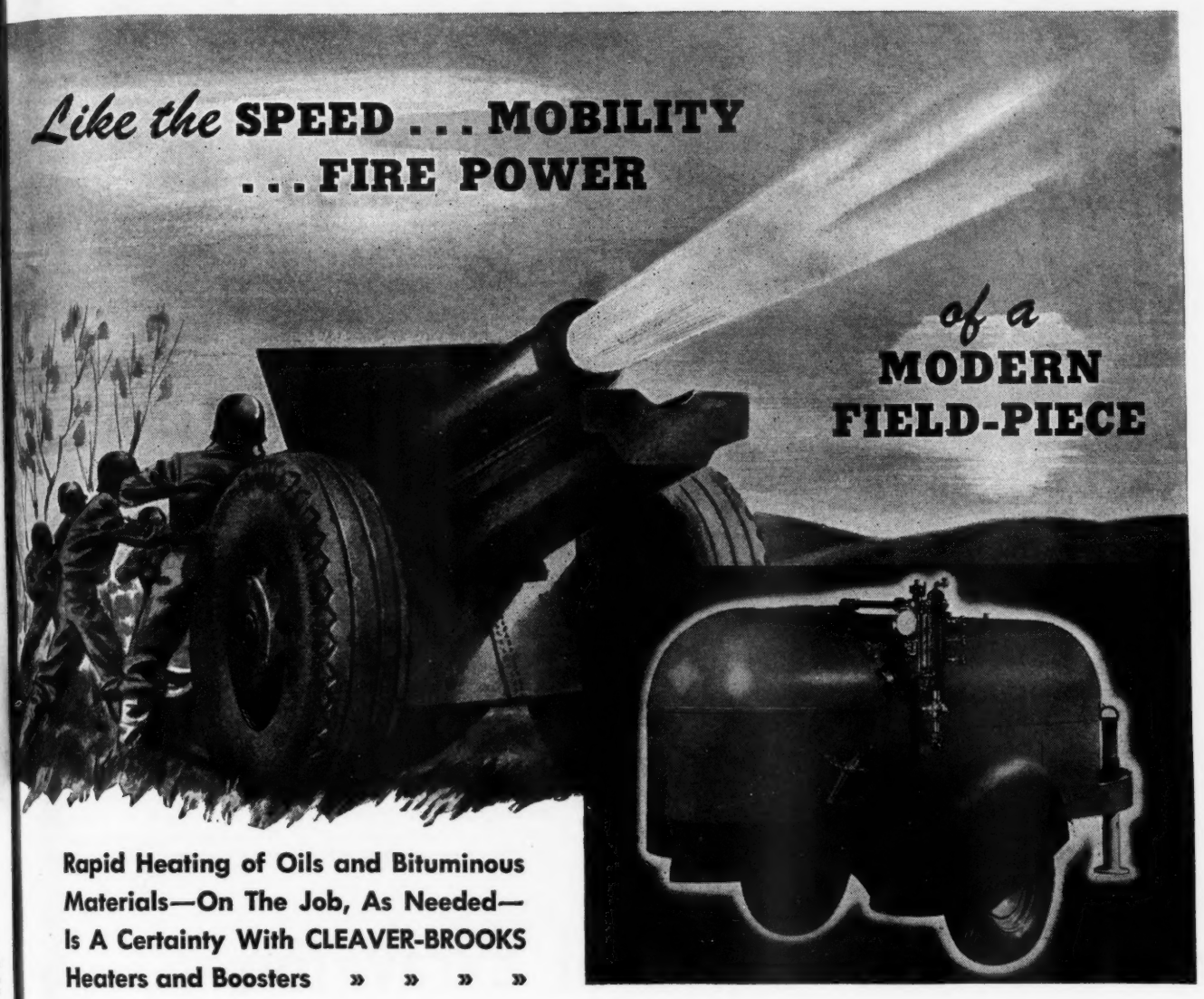
(Continued from page 12)

tween the planning operation, which is imaginative, comprehensive and far-sighted, and the budgeting operation, which is realistic, hard-headed and practical, but which can be nearsighted and narrow. Programming puts vision into budgeting and realism into planning. It should be a bridge between both of them. Only in this way can you expect community support. Such a program will get that support, because such projects will yield a maximum of social good for the expenditure made. And it is that assurance which is the core of our obligation . . . to be properly prepared for a post-war Public Works program."

Scrap Metal From Highways

Several years ago PUBLIC WORKS described a magnetic nail picker, used by several states for removing from their highways nails or other metal objects that might injure tires. This nail picker consists of a light truck carrying, a few inches above the ground, a magnet powered by the motor with strength enough to pick up nails, bolts, wire, cans and other objects. These are held until the power is shut off, when they drop to the road in a heap and are picked up for removal.

Now that the importance of conserving tires and the value of the scrap are both of increased importance, it might be well to adopt the nail picker more generally. The cost is low—any light truck can be used; no special skill is required to operate them, so that any truck drivers can be used for the purpose. To what extent the magnets are available we cannot say.



Rapid Heating of Oils and Bituminous Materials—On The Job, As Needed—Is A Certainty With CLEAVER-BROOKS Heaters and Boosters » » » »

Your crews are not delayed — there's no waiting for road oils or bituminous materials to be brought to application temperatures—when there is a Cleaver-Brooks Tank Car Heater or Booster on the job.

Haul it to the unloading siding by truck or passenger car. Hot, dry steam will flow to the car heating coils in 25 minutes — with every foot of the car coils constantly working because of the exclusive Cleaver-Brooks dry-coil method of condensate return. You do away with the "water wagon" problem as every drop of condensate is returned to the tank car heater under pressure. High-speed, economical performance is due to the original and exclusive Cleaver-Brooks four-pass down-draft flue travel and integral burner construction plus the positive dry-coil method of condensate return.

Cleaver-Brooks Tank Car Heaters are built in two and three tank car sizes — Portable Pumping Boosters in two capacity sizes, with truck mounting or 4-wheel trailer.

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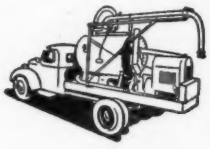
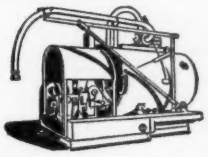
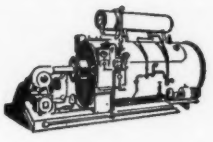
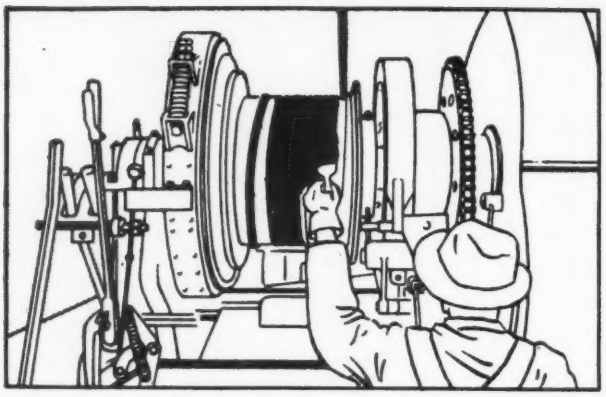
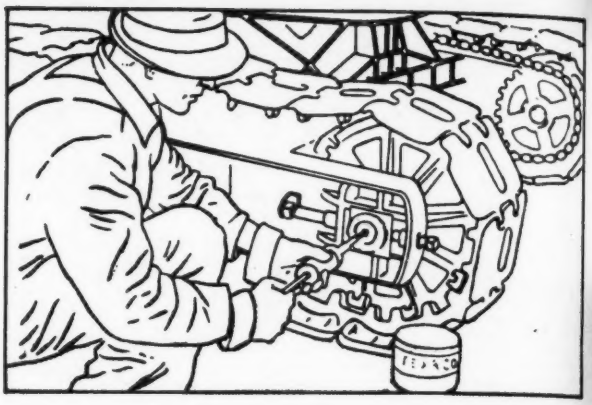
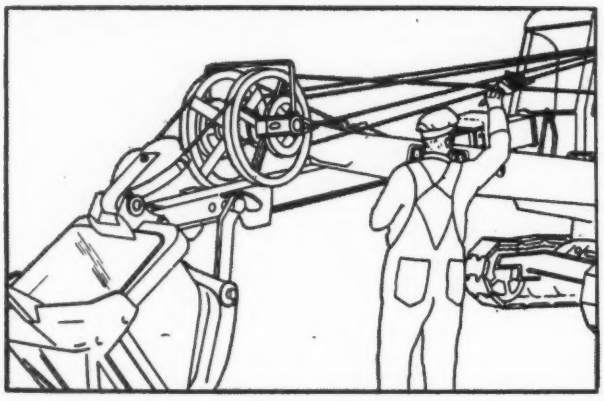
TANK CAR HEATERS . . . BITUMINOUS BOOSTERS . . . AUTOMATIC STEAM PLANTS

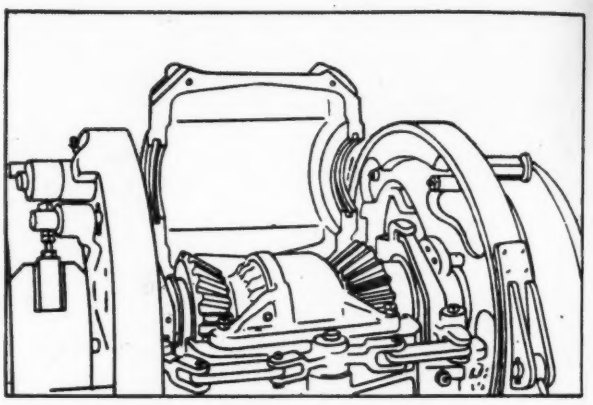










Lubricate ropes and drums regularly. Apply a thin layer often, so lubricant doesn't drip and splatter in operation. Be sure to lubricate suspension ropes, even when not moved. They'll rust their strength away if you don't.



Lubricate crawlers whether machine is propelling much or little. Normal digging reactions shift belts back and forth and cause wear. Keep proper amount of oil in your gear enclosures at all times. Keep dirt and dust out of oil enclosures and containers.

Lubrication of Excavators

Advice as to the detailed procedure in applying lubricants to excavators, much of which is applicable to crawler tractors and other road machinery also.

In previous issues (May, June and July) we have published suggestions for the selection and use of lubricants for road machinery and that used in sewage and water treatment plants. Below we give advice offered by the Bucyrus-Erie Co. for the detailed procedure in applying lubricants to excavators—much of it applicable to other road machinery also. First of all, they say:

Keep lubricants clean. Dirt and grit in a lubricant makes a grinding compound; instead of reducing friction, such a compound builds it up, cuts away steel and wrecks smooth running adjustment.

Keep lubricants covered and stored neatly in a clean place.

Drain oil enclosures when hot, so the draining oil carries off the sludge.

Keep funnels, plugs and oil spouts clean. Wipe off oil can covers before removing.

Keep empty containers that are to be refilled clean and tightly covered.

Clean enclosure covers before removing for inspection.

Clean outside of grease gun before using.

Clean fittings so that grit is not forced in with the grease. When lubricating open or sleeve-type bearings, wipe off excess grease forced out of bearing.

Be sure gun is thoroughly cleaned out before changing type of grease.

Use good lubricants, keep them clean, maintain a regular schedule of lubrication in accordance with manufacturer's instruction chart or manual. Correct lubrication is your best contribution toward machinery long life and trouble-free operation.

Use the right amount and the right kind of lubricant. Too much may be harmful. Small amounts applied often is the answer to most lubrication troubles. A good lubricant in the wrong place may do more harm than good. Do not use graphite greases in ball or roller bearings.

If you are not getting satisfactory lubrication re-

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1 — PHYSICAL CHARACTERISTICS AND PERMANENCY greatly improved by the addition of an olefine polysulphide plasticizing agent, which results in greater bonding strength to metallic and ceramic surfaces, also much higher resistance to mechanical shock and temperature changes.

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5 — TIME SAVING due to Tegul-MINERALEAD'S faster sealing of the lower initial leakage, permitting prompt back filling and clearing of streets.

6 — SAVING IN SHIPPING SPACE, precious these days, with Tegul-MINERALEAD'S compact packaging, 5 ingots to strong carton.

7 — SAVING IN AVOIRDUPOIS — Tegul-MINERALEAD weighs only 1/5th as much as lead — and goes 3 times as far.

8 — SAVING IN SKILLED LABOR —which is unnecessary to work this compound. Caulking and deep bell holes are likewise unnecessary.

9 — NO HOLDING UP OF WORK while fresh batches are added to melting pot; and no time lost in melting, pouring and setting.

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1. Pipe ready to push home.
2. Yarn in place on bottom.
3. Driving the yarn back with hammer.
4. Placing clay under runner.
5. Gate in place — ready to pour.
6. Pouring.
7. Joint poured and runner removed.
8. Cutting off the pouring gate.
9. Finished joint after removing gate.

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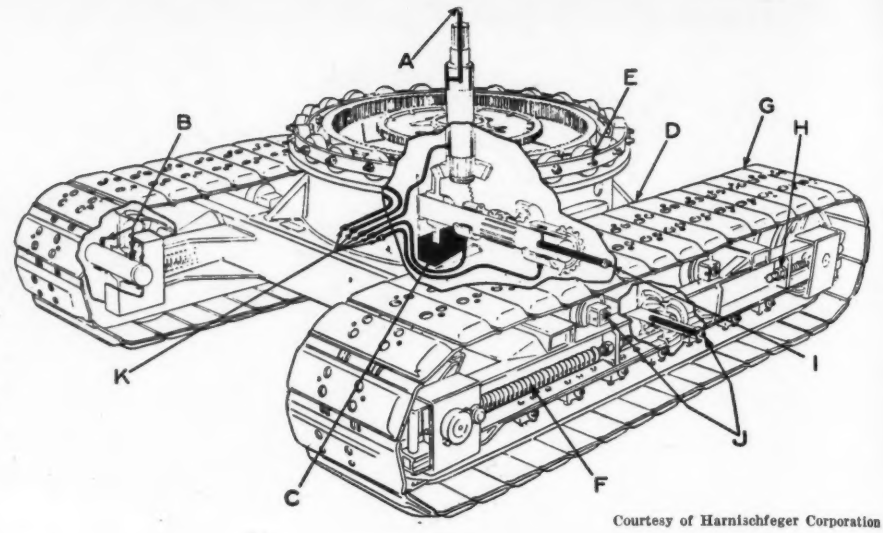

Lubrication Chart for a P & H Excavator.

A is the grease lubricated center top gudgeon bearing. B, the crawler drive and idler shafts, grease lubricated. C, the propel gear case; fill to indicated level with high quality transmission lubricant. D, the drive chain idler sprocket, greased. E, the live roller circle, greased every shift. F, the crawler tension springs. G, the drive chains, oiled according to nature of work. H, the sprocket adjustment bolts. I, the brake drum bushings, greased. J, the track rollers, greased every shift when digging.

Courtesy of Harnischfeger Corporation

sults or are confronted with unusual conditions, consult a representative of a reputable oil company and your excavator distributor. These experienced men are there to serve you—give them a chance.

Be thrifty of lubricants. Get them in where they can work but don't waste them on the outside. However, where you force lubricants through a bearing it is good policy to force out the old lubricant at the other side to clean dirt out (then wipe it off).

Where possible, grease, turn parts to change load direction, and grease again to insure distribution of lubricant to all points of bearing. When lubricating roller chains, use a light oil and be sure to work lubricant in around pins by working chain back and forth and relubricating.

Overheating of a bearing may indicate lack of lubricant, too much lubricant (if in tight enclosure), a wrong type of lubricant (possibly too long fibre for type of bearing), or mechanical trouble of some sort (broken bearing, sprung shaft, etc.).

Have thorough understanding about who is responsible for lubrication and when lubrication is to be done. Usually the day shift handles and takes responsibility for all periodic lubrication, night shift handles only once-a-shift (or oftener) lubrications and special assignments left in writing by the day shift. Handle lubrication at beginning of shift, except any engine crank-case or gear-case oil changes, which are best handled at noon, when oil is at maximum temperature.

Use water-resistant greases outside where parts are subject to ground water and weather. Watch closely and grease more often here if necessary in wet or rainy weather.

Lubricate crawlers regularly, even when machine moves up only occasionally. Digging reactions shift the belts and rollers back and forth and cause friction likely to be more damaging than when parts are rotating and maintaining distribution of the lubricating film. When lubricating track rollers, always "flush out" old lubricant from bearing.

Lubricate cats every two miles of travel on straight moving for small machines, on larger machines more often. Excavator crawlers are built primarily as a foundation to take the shock loads of digging and for short moveups at regular intervals. On long steady moves they should be watched carefully and lubricated at frequent intervals as needed.

Lubricate tread pins. In the past Bucyrus-Erie has recommended following the crawler tractor practice of operating crawlers with dry pins, on the assumption that lubricant here would only create a grinding compound detrimental rather than beneficial. Field tests show, however, that under average pin conditions, treads last longer on our excavators when they are kept lubricated. Try it on your job and watch results. Use drained crank-case oil.

Lubricate ropes (except dragropes on dragline which drag through dirt) and drum faces regularly. Use a thin rope lubricant for penetration, an adhesive-type for lasting qualities, one that has a high surface-tension so it does not collect dirt and grit. Heating the lubricant will help it penetrate; but remember when "painting" lubricant on wire rope, you lose most of the heat on contact with the cold steel, so do this job at noon on the warmest day you can find. Work lubricant into rope.

Lubricate suspension ropes even when boomhoist is not used. Damage from vibration and rust is probably even more serious when lubricant is not occasionally redistributed by flexing over sheaves.

Don't miss the swing rack. It is often neglected on machines with internal racks. Remember that only a quarter to half of this "giant gear" is getting practically all the wear. Especially watch the pinion teeth, which get many times the wear of gear teeth. Lubricate entire unit regularly, but inspect and touch up the shiny wear-spots once a shift.

To hook roller path, apply "tacky" type of lubrication compound with high surface tension resistant to dust. When it becomes cakey and gritty, scrape and clean it off with a kerosene-soaked rag and replace with clean lubricant. On center-pintle type machines especially, watch rollers, particularly rear rollers, to be sure they roll freely. See that pins are lubricated regularly and old grease is not permitted to pack and harden to prevent rollers turning.

World's Worst Road

George P. Mahoney, a Baltimore, Md., contractor, has drawn a unique contract from the War Department. It is to build the world's worst roads and to keep them in an atrocious condition. He was low bidder for the project to construct a motorist's nightmare at the Aberdeen Proving Grounds — roads with simulated shell holes, gaps, sharp, dizzy inclines and submerged roadways — all for testing of the Army's motorized equipment, putting it through conditions it would meet on a much-contested battle area.

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Niagara Alkali Company
Nichols Engineering & Research Corp.
Norwood Engineering Company, The

Omega Machine Company

Pacific Flush-Tank Company
Pacific States Cast Iron Pipe Co.
Pelton Water Wheel Company, The
Pennsylvania Salt Mfg. Co.
Permutit Company, The
Phoenix Meter Corporation
Pitometer Co., Inc., The
Pittsburgh-Des Moines Steel Co.
Pittsburgh Equitable Meter Co.
Pollard Co., Inc., Joseph G.
Pomona Pump Co.
Portland Cement Association
Preload Company, The
Proportioneers, Inc.
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Red Hed Mfg. Co.
Reilly Tar and Chemical Corp.
Reliable Iron Foundry
Rensselaer Valve Company
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Roberts Filter Manufacturing Co.
Ross Valve Manufacturing Co., Inc.
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Salomon & Bro., L. A.
Sewage Works Engineering
Simplex Valve & Meter Co.
Skinner Co., M. B.
Smith Manufacturing Co., The A. P.
Smith-Blair, Inc.
Smith Company, S. Morgan
Sparling, R. W.
Stuart-Brumley Corp.

Thomson Meter Corp.

United States Pipe and Foundry Co.

Vapor Recovery Systems Co., The
Vogt Manufacturing Co.

Wailes Dove-Hermiston Corp.
Wallace & Tiernan Co., Inc.
Warren Foundry & Pipe Corp.
Water & Sewage
Water Works Engineering
Water Works & Sewerage
Water Works Supply Company
Waterous Company
Well Machinery & Supply Co., Inc.
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Some Highway Specifications

Nebraska Specifications for Curb and Gutter and California's for Highway Underdrains

Concrete Curb and Combination Curb and Gutter

These items shall consist of class "A" or other concrete, as indicated in the plans, constructed on the prepared subgrade in one course, of the dimensions shown in the plans in accordance with the following specifications.

Materials.—The materials used shall conform to the requirements stated elsewhere.

Construction Methods.—All forms shall be of wood or metal, straight, free from warp and of sufficient strength when staked to resist the pressure of the concrete without springing. Outside forms for the combination curb and gutter shall be of a depth equal to the full depth of the curb, and the inside forms shall be of the depth of the gutter and shall be so designed as to permit of secure fastening to the outside form. There shall be installed every 4 feet a separator true to the dimensions and cross sections of the combination curb and gutter. All forms shall be cleaned thoroughly and greased or oiled before concrete is placed against them. Forms that have become worn, bent or broken shall not be used.

The subgrade shall be formed at the required depth below the finished surface of the curb and gutter, in accordance with the dimensions and design shown in the plans for the bottom of the curb and gutter. All soft and yielding or other unsuitable material shall be removed and replaced with suitable material. This material shall be compacted thoroughly and finished to a firm, smooth surface.

The concrete shall be mixed in accordance with (insert suitable reference). When required in the plans, the subgrade shall be covered with a layer of tar or asphalt-impregnated paper or other impervious material meeting the approval of the Engineer. The concrete shall be placed in the forms and tamped sufficiently to bring mortar to the surface after which it shall be finished smooth and even by means of a wooden or cork hand float. The edges of the face and back of curb are to be rounded to a radius of ¾ inch and templet joints are to be opened with double edge while the concrete is still soft.

Forms may be removed 12 hours after the concrete has been placed. All honeycombed areas or small defects shall be properly pointed up with 1:2 mix mortar, and the edges shall then be banked with moist earth to a width of 6 inches or more beyond neat lines.

As soon as the concrete has been finished it shall be covered with burlap and shall be kept saturated for 72 hours. The Contractor shall protect the concrete curb and gutter from injury by his workmen and equipment or from any other agency until final acceptance is made.

Method of Measurement.—The footage to be paid for under this item shall be the number of linear feet of combined curb and gutter or of concrete curb measured in place.

Basis of Payment.—The combined curb and gutter, or curb, will be paid for at the contract unit price per linear foot for "Combination Concrete Curb and Gutter" or for "Concrete Curb" complete in place, which price will include all materials, forms, equipment, tools, labor, royalties, and work incidental thereto. *Nebraska Department of Roads and Irrigation.*

Underdrains for Highways

Description. — Underdrains consisting of standard drain tile or perforated metal pipe as shown on the plans or designated in the special provisions shall be installed at the locations shown on the plans or where ordered by the Engineer, and to the lines and grades given by him.

Manufacture.—Standard drain tile shall conform to the requirements of the American Association of State Highway Officials' Standard Specifications for Highway Materials, Specification M-66-38 (or other designations as desired).

Perforated metal pipe underdrains shall conform to the requirements of the American Association of State Highway Officials' Standard Specifications for Highway Materials, Specification M-36-38, with subsequent amendments, except as modified elsewhere in these specifications and with the following additional modifications.

The gauge of metal in the pipe to be used will be designated in the special provisions. Asphalt coating of perforated metal pipe underdrains will not be required.

Perforations may be punched in the pipe after galvanizing.

The metal pipe shall be perforated with holes one-quarter inch (¼″) in diameter, placed at one and one-half inch (1½″) centers in the valley of each corrugation. The number of longitudinal rows of perforations shall conform to the following table:

Diameter, Inches	*No. of Rows*	*Diameter, Inches*	*No. of Rows*
8	7	18	13
10	8	21	15
12	9	24	18
15	11	30	22

Rock filling material for use in backfilling trenches under, around, and over underdrains shall consist of clean gravel or crushed stone uniformly graded from coarse to fine. The material shall not exceed six inches (6″) in greatest dimension and the minimum size shall not be less than three-fourths inch (¾″) nor more than one and one-fourth inches (1¼″) in greatest dimension, with the additional requirement that the maximum size of the aggregate under the pipe and in the top six inches (6″) of the backfill, shall not exceed two and one-half inches (2½″) in greatest dimension.

Laying. — Trenches for underdrains shall be excavated to a width equal to the outside diameter of the underdrain plus one foot (1′) and to a depth of approximately six inches (6″) below the grade established for the bottom of the drain. The space below grade shall then be filled with a layer of rock filling material after which the drain pipe shall be laid to the required line and grade. Drain tile shall be laid end to end and the joints shall be adequately wrapped with burlap or other approved material to prevent infiltration of fine material. Perforated metal pipe shall be laid with the perforations at the bottom and the sections shall be joined with band couplers.

After the pipe has been placed, the trench shall be backfilled with rock filling material to a point six inches (6″) below the ground surface, the material to be placed in layers not over one foot (1′) thick. The remainder of the trench shall be backfilled with earth and thoroughly compacted.

Measurement.—The quantity of underdrains to be paid for shall be the actual length placed, measured along the slope to the nearest one-tenth foot (0.1′)

except that no payment will be allowed for underdrains placed in excess of the length ordered by the Engineer.

Elbows will be paid for at the price per lineal foot for the size of underdrain involved, measured along the center line.

Payment.—The price paid per lineal foot for standard drain tile or perforated metal pipe underdrains, shall include full compensation for furnishing all labor, materials, tools and equipment and doing all the work involved in furnishing and installing the underdrains complete in place as herein specified, except structure excavation and the furnishing and placing of rock filling material.

The excavation of the trench will be measured and paid for as structure excavation except that the limiting vertical surfaces shall be considered as six inches (6″) outside of the outside dimension of the underdrain pipe, and with the further exception that full compensation for placing and compacting the upper six inches (6″) of earth backfill in the trenches as above specified shall be considered as included in the prices paid for the other items of work and no additional compensation will be made therefor.

Rock filling material will be paid for by the cubic yard for the quantity placed in accordance with the dimensions shown on the plans, and rock filling material placed in excess of these dimensions will not be paid for. The price paid per cubic yard for rock filling material shall include full compensation for furnishing, hauling, and placing the material and all incidental work connected therewith.—*California Department of Public Works, Division of Highways.*

Wartime and Peacetime Planning

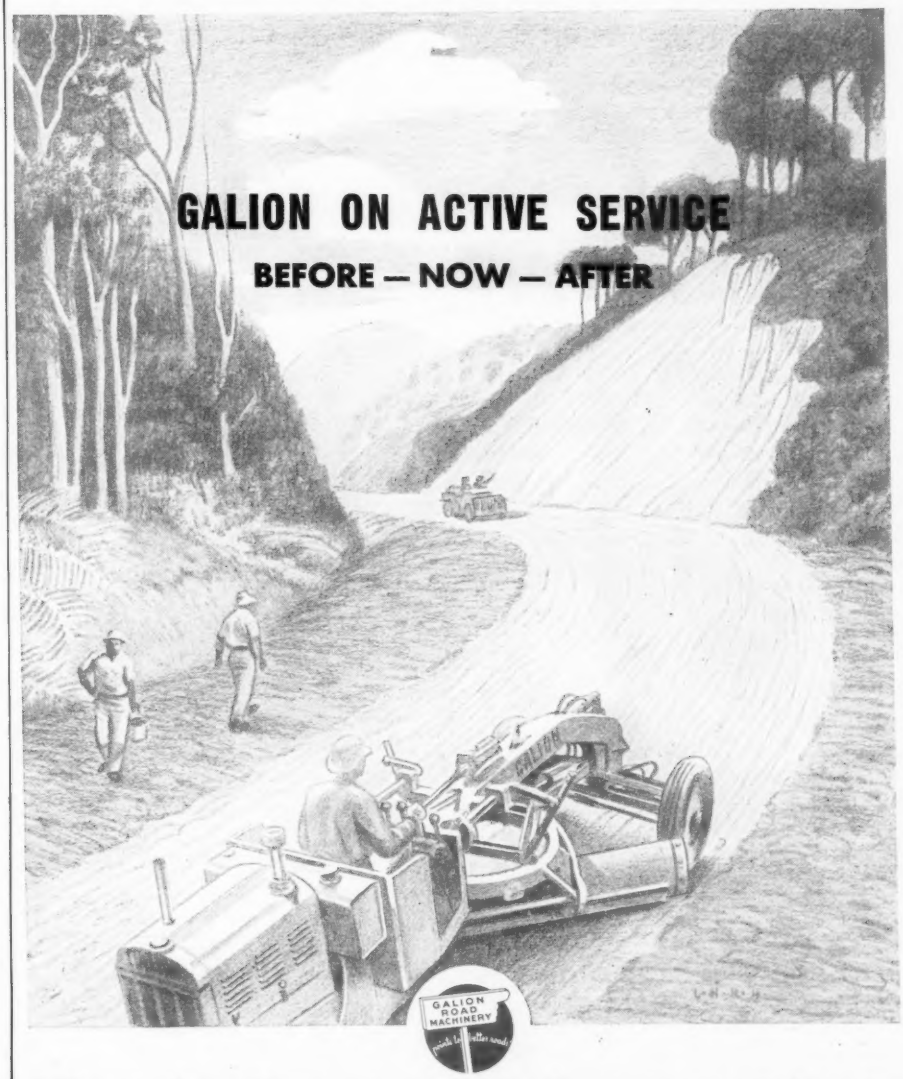
(Continued from page 7)

of the peacetime chiefs — of us, here at home. That planning, too, must begin months in advance; even now there may hardly be time—we do not know. Perhaps you are planning an airport or a sewage treatment plant — have you purchased the site selected? Legal snarls may tie that up for months before work on it can be started.

In fact, peacetime *planning* is not enough. It is essential, but not enough. It must be succeeded by preparedness. Except for decisions that might have to be made between foreseen alternatives, the planning for the Sicily invasion was probably completed months ago, and those months used in actual preparation — in getting the materials where they could be had on an hour's notice. How many months we have to complete our peacetime preparation we do not know. But if they are few, for most of us the preparedness may be "too little and too late."

To say we should not begin to plan for peace until the war is over is foolishness. The War Department began planning for peace months ago, and has, ready for immediate service, men trained for civil, peaceful administering of any countries that must be controlled by us temporarily when war in them ends.

We are fighting a war to obtain peace. Should we deliberately leave ourselves unprepared to enjoy that peace when we get it?



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The Role of Moisture in Soil Mechanics

The behavior of the water in moist soil is adequately explained by its surface tension, angle of contact, and viscosity. The angle of contact is the only consequence of the attraction of the soil particles for water that need be taken into account. On account of the curvature of the menisci at which the soil water is in contact with the atmosphere, the water is under less than atmospheric pressure. This pressure deficiency is called the suction of the water.

In a permeable soil, with a sufficiently deep water-table, two zones are distinguishable by measuring the vertical variation of suction. The lower zone immediately above the water-table, sometimes called the capillary fringe, is characterized by relatively rapid adjustment of the water to a state of hydraulic equilibrium with the ground-water. Surface tension and contact angle alone account for water behavior in this zone. In the upper zone, hydraulic equilibrium under gravity is not established within the time of observation. The additional factor here operating is viscosity, which allows water to move only very slowly through the small interstices which alone can remain full of water at the suction developed in this zone. Water in the upper zone is capable of limited movement under the high suction gradients developed by plant roots, by freezing, and by evaporation; for, while the suction developed by drainage never exceeds a few feet of water, plant roots can apply suction up to 500 ft. of water or 16 atmospheres, ice below the freezing point can induce somewhat higher suctions, while evaporation develops suctions of 1,000 atmospheres (more or less, depending on the relative vapor pressure).

Clay particles carry negative charges and have associated with them exchangeable cations. There is, in consequence, an electrostatic attraction tending to flocculate the clay and a repulsion due to the osmotic activity of the exchangeable cations, tending to deflocculate it. Suction and the electrostatic attraction cooperate in promoting friction between the particles. Osmotic repulsion tends to reduce internal friction and facilitate close packing.

The moisture content of soil at low relative vapor pressures is strongly correlated with the number of exchangeable ions. Observation of the apparent specific volume of clay in water and organic liquids indicates that water molecules tend to cluster around the ions and negatively charged "spots" on the clay as around the ions in a solution of electrolytes.—*Dr. R. K. Schofield, Agricultural Station at Rothamsted. Highway Research Abstracts.*

Joint Sewerage Facilities for 13 Local Units

Eight cities, one village, three townships, one county and the state of Michigan have reached a joint agreement on the construction and operation of sewage disposal facilities, and work has been started on a large sewer and a pumping station. The area to be served is in the southeast part of Oakland County just north of Detroit and includes the cities of Berkley, Clawson, Ferndale, Hazel Park, Huntington Woods, Pleasant Ridge, Royal Oak, and the village of Oak Park. A serious sanitation problem had developed because sewage from this area, except for the part served by the Royal Oak disposal plant, had been emptied without treatment into a creek which in turn polluted the Clinton River and parts of Lake St. Clair. The state health department and the state stream control commission ordered the several municipalities to abate the nuisance. Incidentally, about a year ago the Federal Housing Administration refused to insure any further mortgages for residential building in the area except in the region served by the Royal Oak disposal plant.

After 17 years of surveying and negotiating under adverse conditions with regard to state laws, actual construction of the project is under way. Of the total cost of $1,567,000 the Federal Works Agency will make a grant of $662,000, and the balance of $905,000 will be financed by the sponsors through the issuance of 30-year revenue bonds which will be retired from sewer service charges based on the water consumption of the several municipalities using the sewerage facilities. The cost includes the sum of $137,884 to be paid to the city of Detroit for a proportionate share of the capital cost of the Detroit sewers which are utilized to carry the sewage from the south part of Oakland County to the point where it enters the intercepting sewer of the Detroit sewage disposal system.

Briefly, the facilities to be constructed are a five-foot six-inch tunnel intercepting sewer and a pumping station to lift the sewage to a gravity flow section intercepting sewer. By means of diversion chambers storm water will continue to be discharged into a creek while the sanitary sewage will be carried through the Detroit sewer system to the disposal plant where it will be treated before being discharged into the Detroit River.

The annual sewer service charge to the owner of a small home using 5,000 cubic feet of water per year will be approximately $5 and the owner of a medium-sized home about $7.20; the actual charge will be based on water meter readings and must produce sufficient revenue to meet annual maintenance, operating, and debt service charges.

Oakland County, through the office of the county drain commissioner, will administer all phases of the project including the maintenance and operation of facilities when completed. Written agreements between the county and each of the cities involved will provide that each community agrees to dispose of all its sanitary sewage through the new sewage disposal system. agrees to pay for such disposal at rates which will be sufficient to cover costs based on the quantity of water consumed, and that Oakland County will have the right to terminate sewage disposal service to any community that is 90 days delinquent in payment of the charges due. Oakland County has made an agreement with Detroit providing for using Detroit's sewerage facilities, agreeing to pay certain fixed amounts for flowage rights, maintenance, and sewage treatment. Agreements between the county and cities are to remain in force until the bonds have been retired but not longer than 40 years and between the county and Detroit for 50 years.—E. M. Shafter, city manager. Royal Oak, and Jay F. Gibbs, city manager, Ferndale, Michigan, in *Public Management.*

Copper Plating By Sewage

The Patapsco River sewage treatment works of Baltimore, Md., serve a section of that city and also of Anne Arundel County. They were designed to handle the sewage from 70,000 persons in 1950, giving primary treatment only at present. The removal of settleable solids has averaged 90% and the B.O.D. reduction has reached 50%. These favorable results are believed to be due to some extent to discharges of copper compounds from industrial plants into the sew-

erage system. The incoming sewage upon occasions has a green color which is believed to be due to the presence of copper sulphate. The metallic parts of the sludge removal mechanism are frequently plated with metallic copper which would indicate that there is an exchange of metals in the tank due to electrolytic action. Copper has been found as well in the sludge and there has been some interference with the proper operation of the digesters with a corresponding decrease in gas production. An effort is being made to determine the source of the entrained copper.

Snow on Airport Runways

When snow falls deep on the hundreds of thousands of square yards of runways on an airfield, clearing them by means of pusher plows or blades is often impracticable, or even with rotary plows, if they are available. Consequently some airports are compacting the snow by rolling—a practice used years ago by some New England cities for their streets. More than ten years ago this method was employed on some of Idaho's airports, using a 36" corrugated pipe 8 ft. long fitted with an axle and wood framework at the ends and drawn by horses, sand bags providing additional weight desired.

Recently this method has been developed, three large rollers operating in *V* formation to cover a wide area being drawn by a tractor. One such use, at the Malton airport near Toronto, Canada, is described as follows in the *Highway Magazine*.

A welded or bolted metal frame provides the hitch for the single or multiple rollers. To prevent snow from accumulating on the rollers, a strike-off or scraper is set close to each roller. The corrugated rollers can also be made of "nestable" pipe to facilitate shipping and storing.

For airports confronted with the problem of keeping runways open in winter, the snow roller may offer the best solution. A drawing of typical roller equipment has been prepared by the Armco Drainage Products Association, Middletown, Ohio. This drawing is available, through the Association or its member companies, to those responsible for maintaining airports. Materials would be available only on suitable priorities.

Census Data on Water and Sewerage

In our February issue we called attention to data relative to water treatment plants collected by the U. S. Public Health Service and compiled in mimeographed pamphlets, in which 5,372 plants were listed. At about the same time data relative to sewerage systems and sewage treatment plants were collected and compiled by the U. S. P. H. S. At that time the Service stated that it hoped to issue annual supplements to keep the data up to date.

The first of such supplements on each subject has recently appeared. These "include available data on additions and revisions up to the end of calendar 1941." "Additions" are "individual system entries identified in the inventory for the first time," new systems or old ones not previously reported. The numbers of these additions in some states are surprisingly large. The State of Wisconsin reports 14 additions; Texas, 20; Missouri, 21; Minnesota, 16. But Arizona, Connecticut, Idaho, Kentucky, Louisiana, Maine, Maryland, Missouri, New Hampshire, Ohio, Oregon, South Dakota, Vermont and Wyoming report no new municipal systems or treatment plants, although most of them report additions or changes to existing plants.

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Wartime Operation of New Bedford's Water Works

Excerpts from the Report of the New Bedford, Mass., Water Board for the year 1942. Only 7% unaccounted-for water

GUARDS have been maintained over the pumping station and surrounding property, under the direction of the Chief of Police, at a cost of about $11,000 to this department, and $11,000 to the Police Department, for the year.

Water Works Auxiliary. Early in the year it was recognized by the Water Board that the small staff of this department would be unable to cope with a large number of simultaneous breaks in the water distribution system which might result from military operations. It was decided to organize a volunteer force in accordance with requirements of the Civilian Defense Office for the specific purpose of closing valves in a major emergency to prevent loss of water and consequent loss of pressure. A solicitation of local plumbers to perform this service met with very generous response. The following have qualified for this service:

Piping Inspection. Federal control of critical metals, notably of copper, has made it impossible for civilians to secure copper or brass pipe and fittings for repair or installation of domestic water systems. Under emergency conditions, it has been deemed advisable to relax the requirements of our Piping Regulations prohibiting the use of ferrous pipe. Conditional permits have been granted, allowing the use of iron and steel piping since other metals became unobtainable. Records of all work done under conditional permits are kept in a separate file so that future inspections can be undertaken when non-ferrous piping becomes available.

Distribution System. Twenty-seven hydrants have been broken off as a result of traffic accidents. The cost of repairing them was $1,410.48, of which $674.21 has been reimbursed by the owners or their insurance companies. This does not include the cost of water wasted through the breaks, which is quite an item. Because of the difficulty of securing new hydrants and parts to repair old hydrants, we are approaching a condition where we will be unable to replace broken hydrants.

Six-inch cast iron distributing mains in Tallman, Holly and Brook Streets were cleaned under contract with the National Water Main Cleaning Company by means of pressure tools, at a cost of 10¢ per lineal foot.

A later contract with the Flexible Underground Pipe Cleaning Company was completed, covering the cleaning of two-inch and four-inch cast-iron distribution pipes at several locations where they were badly filled with rust. This work was done by means of rotating rods equipped with special heads, at a cost of 15¢ per lineal foot.

It is not practicable to use pressure tools on pipes smaller than six inches in diameter. Both methods proved very satisfactory, and restored the original carrying capacities of the pipes.

During the year, every hydrant was examined internally, and packing and bolts were replaced where necessary. They are badly in need of painting.

All main valves and valve boxes have been examined and tested by the Water Works Auxiliary, and faults reported by them have been corrected.

Consumption. Based on the period from July 1, 1941 to June 30, 1942, which is the time all meter readings are available, meters accounted for 93% of all water pumped. This is a remarkably high percentage. In our opinion, it is accounted for through improved registration of meters as a result of overhauling and repairing, and through reduced use of water for flushing purposes. During the past ten years, the percentage of the total pumpage reported through meters has increased from 83% to 93% and the loss of water unaccounted for has decreased from 619 million gallons to 260 million gallons. Unaccounted for water is lost through slippage of meters, leakage from mains and services, water wasted through broken hydrants, flushing mains, water used for fire fighting, and for testing.

The personnel of the department is at the lowest level in the past twenty-five years. The average age of our seventy-five regular employees is 51 years. There are only four employees less than forty years of age. It is highly desirable that young employees be added to our staff as soon as conditions permit.

Extension of Water Plants to "Adjacent" Territory

The Pennsylvania statute authorizing water companies to extend their plant into adjacent districts was held not to apply to townships definitely beyond a water company's charter area. "Adjacent thereto" in the company's charter could not be construed to embrace distant territory outside the borough in which the company operated. (Cole v. Pennsylvania Public Utility Commission, Pennsylvania Superior Court, 22 A. 2d 121.)

Judicial Definition of "Water Supply System"

Denying injunction of the City of Hoboken by the State of New Jersey from operating a water supply system owned by the city until the superintendent of the system had obtained a license to act from the State Department of Health, the New Jersey Court of Chancery held (State vs. City of Hoboken, 22 A. 2d 587) that the right to define what the term "water supply system" as used by the legislature implies resides in the courts. "When the legislature fails to clarify a term of doubtful meaning, then the courts, if called upon, will define, interpret or construe the statutory enactment. That is a well-recognized judicial function."

The court found no evidence offered to show that the city has a water supply system within the meaning of the statute upon which the suit was based. (Hoboken is supplied with water by Jersey City which derives its supply from the Rockaway river and treats it with ammonia and chlorine.)

Maintenance of Electric Motors

By far the largest percentage of the machinery used in sewage treatment and water purification and pumping plants, in highway department repair shops and practically all stationary equipment, is driven by electric motors. These are made almost fool-proof but not quite; there must be some intelligent maintenance of them if they are to give the long, dependable service of which they are capable. Safety Research Institute gives the following "ten commandments of motor maintenance" which, it says, should always be observed.

I. Open-type motors should be blown out weekly; those operating under severe conditions, daily. Use no more than fifty pounds of pressure to avoid possible damage to insulation.

II. Follow manufacturer's instructions in lubricating motors. Too much oil is as bad as too little, causing deterioration of insulation.

III. Inspect bearings weekly or oftener. Feel temperatures, examine for excessive end play, and make certain the oil rings are working.

IV. Inspect brushes and commutators weekly or oftener. Make certain the brushes are seated perfectly and commutators are smooth. Use proper grade of carbon brushes to prevent wear of commutator and reduce sparking.

V. Where motors operate with excessive belt tension, check the air gap between rotor and stator every week. A monthly check of motors in average use is sufficient. Difference in the width of the gap around the circumference of the rotor will indicate extent of wear on bearings.

VI. Where motor leads are exposed to view, check them weekly to see that connections are tight, well insulated and protected, and free from oil.

VII. Inspect ground connections weekly, keeping them tight and in good condition. This is for the protection of employees, and for the proper operation of over-current protective devices.

VIII. Set up a regular schedule for overhauling motors. Most motors should be overhauled annually, while those in severe use should be overhauled twice a year or oftener.

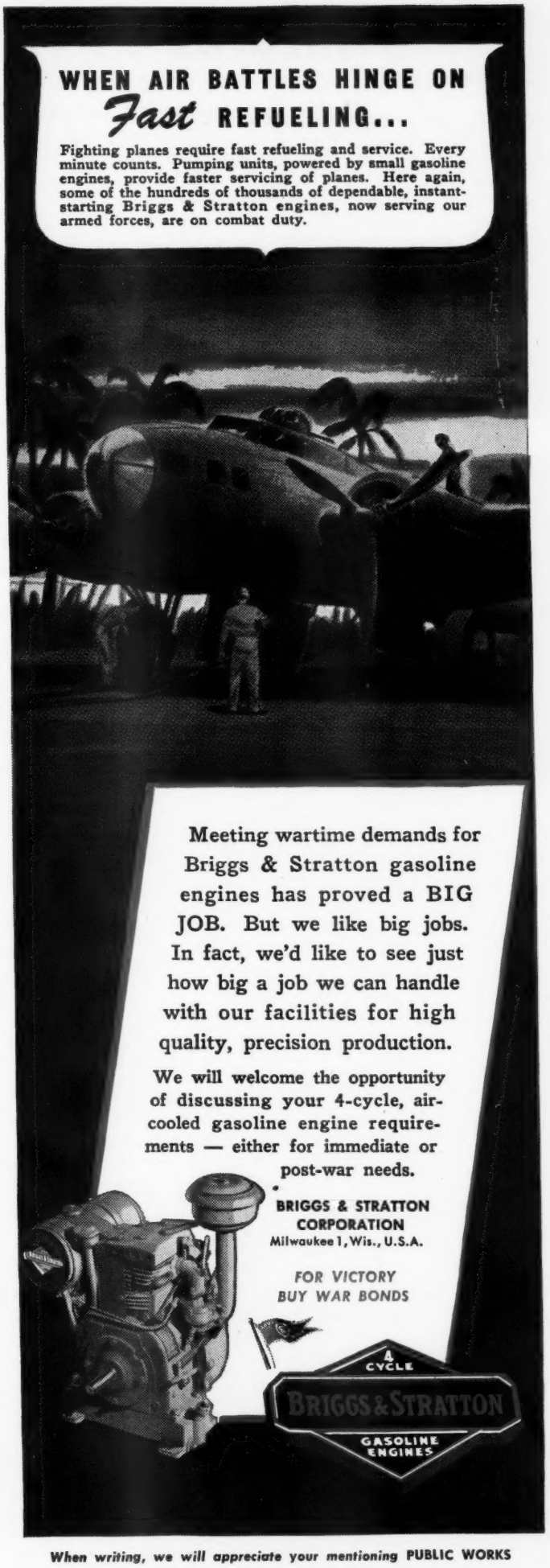
IX. Dismantle the motor for a complete overhaul job. Wash all parts with carbon tetrachloride or some other safety solvent. Paint the windings with a good, oil-resisting insulating varnish.

X. Keep the area around the motor as clean as the motor. Arcing frequently ignites oily material that has not been cleaned up.

When fire breaks out in or around a motor, shut off the power before attacking the flames, if possible. Do not depend upon the circuit breaker operating or a fuse blowing out, but shut off the power. This will minimize damage to the motor and prevent continued arcing from re-igniting the fire. When the motor or conductors are dead, direct the fire extinguishing agent into the motor or upon whatever is burning, just as in any other fire. As soon as the fire is out, ventilate the area thoroughly to clear out smoke and fire gases.

Why Some Sewage Plants Are Unpopular

In one of the southern states, of 59 septic tanks examined in 1940, 9 were badly overloaded, having been built in 1910 to 1940, and were then receiving 160% to 780% of their design capacity.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Hazards in Trench Excavation

What to look out for, and what precautions to take to prevent accidents. Recommended details of sheeting. Precautions in unstable soil.

The National Safety Council has compiled, from experiences learned from many sources, the hazards of trench excavation; and precautions that should be taken to avoid accidents are described by them in a data sheet (No. D—Con. 2), copies of which can be obtained from the Council, 20 North Wacker Drive, Chicago. An abstract of the data is given below.

The hazards are:

1. Cave-in or slipping of side walls of trench.
2. Materials falling on workers in the trench.
3. Falls of persons when climbing into or out of the excavation.
4. Men working too close together.
5. Stumbling over equipment or excavated material, or falling into trench, by public.
6. Encountering noxious or flammable gases.

Of these, the first is the most important. The precaution is adequate shoring. Most cave-in accidents occur because of taking a chance without shoring; inadequate knowledge of the shoring necessary or misjudgment of soil stability; failure of shoring due to unexpected or transient loads on the shoring structure or ground surface at the edge of the trench, or from vibration due to traffic; use of defective shoring material; failure to maintain shoring properly after changes incidental to operations, or damage by washout or heavy rains; failure to place excavated material far enough back from the trench; and undercutting of trench walls by trenching machines.

The table gives the shoring details specified by the A.S.A. Safety Code. These are *minimums* only; unusual conditions of soil, adjacent or crossing lines of pipe, conduits, etc., may require heavier construction. This table should be used only as a check and not as design specifications. Timber cross-braces must increase in cross-section as the width of the trench increases, and the spacing between them must decrease with their distance below the surface. Walers should not be used as supports for platforms to carry concrete mixers or other heavy machinery or equipment. The sheeting should always extend at least 18" above ground level. Cleats, or "scabs," should be nailed in place over joints between struts and walers, to prevent struts falling, as by weight placed on them, or reduced friction between them and the sheeting caused by caving of the earth.

Where the soil is removed by buckets, space between struts must be sufficient to allow lowering and raising these with plenty of allowance for swinging. The cross dimensions of both struts and walers should be increased as this space increases.

In dismantling shoring, cross-bracing should be removed cautiously, either by having the braces pulled out from above with lifting tackle, or by introducing screw jacks that will take up the strain on wedged timber cross-braces so they can be removed easily. The strain on the screw jacks may then be released very slowly, and the condition of the side walls taken into account. Back-filling should closely follow the removal of shoring.

To the above we would add a few precautions from our own experience in many years of sewer construction.

Keep the sheeting driven down to the bottom of the trench on both sides. Should the sheeting along the length of a waler drop a foot or more (as when starting to drive it after the excavation has been carried a foot or two below the bottom of the sheeting) the struts will be loosened and the whole sheeting on both sides of that section may collapse.

Watch the shoring structure to detect incipient caving of banks; once they start moving inward no possible force can push them back. If a waler begins to bend ever so little, or a strut crush further into the face of a waler, put in more struts at once; and it may be necessary to remove the excavated soil from the bank at that point. Watch the ground surface for several feet back from the trench; should a crack paralleling the trench appear, increase the bracing at once.

In clay or other compact soil, caving usually occurs by the earth falling forward as a mass. But sandy soil more often flows out under the bottom of the sheeting or trickles out between the planks. This may relieve the pressure against the sheeting at the top, letting the top walers and braces drop and threatening the entire

A.S.A. SAFETY CODE FOR CONSTRUCTION WORK
Part III Excavation Work—Tabulation Sections 620 to 628
TABLE I

Trenches not more than 42" wide.

Depth of Trench in Feet	Sheet Piling		Stringers (Walers)		Cross Bracing	
	Size	Horizontal Spacing	Size	Vertical Spacing	Size	Horizontal Spacing
	HARD AND SOLID SOILS					
4'-10'	2"x6"	6' c-c	None		2-2"x6" up to 7' 3-2"x6" up to 10' 3-2"x6" to 13'	6' c-c
10'-15'	2"x6"	4' c-c	None		4-2"x6" to 15'	4' c-c
Over 15'	2"x6"	Close Tight	4"x12"	4' c-c	4"x12"	6' c-c
	SOIL LIKELY TO CRACK OR CRUMBLE					
4'-10'	2"x6"	3' c-c	2"x6"	Top and Bottom 3 in	2-2"x6" to 7' 3-2"x6" to 10' 3-2"x6"—13'	6' c-c
10'-15'	2"x6"	2' c-c	2"x6"	height	4-2"x6"—15'	6' c-c
Over 15'	2"x6"	Close Tight	4"x12"	4' c-c	4"x12"	6' c-c
	SOFT SANDY FILLED-IN OR LOOSE SOIL					
4'-10'	2"x6"	Close Tight	4"x6"	2 up to 7' 3 up to 10'	4"x6"	6' c-c
			4"x6"	3 up to 13'		
10'-15'	2"x6"	Close Tight		4 up to 15'	4"x6"	6' c-c
Over 15'	2"x6"	Close Tight	4"x12"	4' c-c	4"x12"	6' c-c

Trenches more than 42" in width.

	HARD AND SOLID SOILS					
4'-10'	2"x6"	6' c-c	4"x6"	4' c-c	4"x6"	6' c-c
10'-20'	2"x6"	Close	6"x6"	4' c-c	6"x6"	6' c-c
20'	2"x6"	Close	6"x8"	4' c-c	6"x8"	6' c-c
	SOILS LIKELY TO CRACK OR CRUMBLE					
4'-10'	2"x6"	3' c-c	4"x6"	4' c-c	4"x6"	6' c-c
	SOFT SANDY FILLED OR LOOSE SOILS					
4'-10'	2"x6"	Close	4"x6"	2 up to 7' 3 up to 10'	4"x6"	6' c-c

Trenches of any width.

	SOILS HAVING HYDROSTATIC PRESSURE					
8'	2"x6" T&G*	Close	6"x8"	4' c-c	6"x8"	6' c-c
Over 8'	3"x6" T&G*	Close	8"x10"	4' c-c	6"x8"	6' c-c

**Sheet steel piling may be used in place of tongue and groove piling.*

shoring structure. In such soil it is desirable to fasten the struts to the walers firmly by spiking on cleats, and spike a vertical plank to all the walers at each end of each waler, so that no waler can drop out of place. Prevent sand from running out under the sheeting by keeping it driven below the bottom of the trench at all times; and from trickling between the sheeting by using t & g plank, or by calking joints with rags, stuffing hay behind them, etc.

Where surface clay is underlain by sand, the latter may run out, leaving a surface layer unsupported, which may suddenly drop, carrying with it equipment, men, etc. Where such undercaving is suspected, break up the top roof of clay, a few feet at a time, and pack it down into the cavity behind the sheeting, then fill up to the surface with excavated sand. Where sandy soil under a street pavement runs out and leaves a cavity, the same procedure may be followed; but if the pavement has a concrete base and the caving is not extensive, it may be better to cut off the top of every third or fourth sheet pile low enough to permit introducing clay or other stable soil into the cavity.

Put in a new tier of walers and struts as soon as the excavation is 3 ft. below the then-lowest tier; where the soil pressure is heavy, as in running sand, reduce this to 1 ft., lowering these walers from time to time until the desired distance is reached. But be sure to keep the walers on opposite sides of the trench at the same level at all times, not driving one side down more than an inch before driving down the opposite waler the same amount.

In clay or pure sand it may be desirable to chisel-edge the bottom of the sheet piling; but where there are stones, these are apt to crush the chisel-edge and may cause the pile to drive out of plumb.

When a sheet pile becomes broken in driving so that it cannot be driven further, it may be possible in firm soil to cut it out and drive another in its place. If the soil is not firm, drive another behind it, chisel-pointing it so that it will press toward the old one and not draw away from it. This may be aided by introducing a small stream of water through the broken pile during the driving; but use only enough water to soften the soil—be careful not to wash out a cavity.

Safety and efficiency will be improved if ladders for access to the bottom of the trench be provided—say one for each 100 ft. of trench if more than that length is open at one time.

Beware of old trenches. Soil in streets when once disturbed does not become stable for years thereafter, if ever; therefore in digging a trench within two or three feet of an old one, sheeting should be begun as soon as the excavation reaches a depth of three or four feet, no matter how solid the soil appears to be.

Sewer Assessment Procedure

The failure of a city board of public works to place on file a map showing the boundary lines of a district beneficially affected by a sewer, as required by statute, would be merely an irregularity in the proceedings which would not be available to property owners in defense of a contractor's suit to enforce a sewer assessment lien. (Varble v. O'Neil, Ohio Appellate Court, 37 N. E. 2d 276.)

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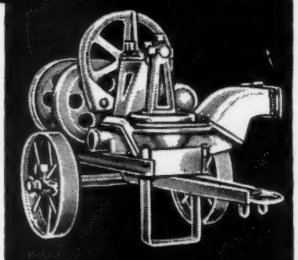
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Depreciation Reserve in Water Rate Regulation

A water company appealed from a rate order of the New Hampshire Public Service Commission, claiming a higher valuation than that on which the Commission based the prescribed rates, a higher rate of return than 5½% and a higher estimate of charges which would yield the return. The New Hampshire Supreme Court (State v. Hampton Water Works Co., 18 A. 2d 765) elected to exercise fully its revisory powers as to the contested conclusions from the evidence and declaration of legal rules, instead of recommitting the case to the Commission for further proceedings in the nature of a new trial.

Moreover, the court said, "If rate regulation is to be effective, there must come at some time an end of hearings and a decision of the questions involved." This is particularly true in view of the New Hampshire statute, which limits the life of a rate order to a term not exceeding two years.

The test of value of property for rate making purposes is what it is worth in money what it will bring in money to the seller, or what it will cost the buyer in money (Grafton, etc., Co. v. State, 78 N. H. 330, 334).

The purpose of a statute requiring a utility to carry a proper and adequate depreciation account is to secure the eventual use of the fund in rehabilitation and development of the plant. It is in the consuming public's interest that service shall not be impaired, and the establishment of the fund and its use in such manner serves to maintain the plant in its integrity and to permit its enlargement to meet increased demand for its service. This statutory objective is further effected by the provision that no dividends shall be paid except out of net income and after setting aside any required depreciation reserve. This prohibition as to dividends means "that the reserve shall be deducted from the gross earnings as an item chargeable against them before the net earnings are ascertained."

The court rejected the Commission's interpretation of the statute as to the effects of depreciation, i.e., that the statute impliedly forbids the use of a depreciation reserve for purposes of dividend declarations, and that the customers may not justly be charged to pay a return on such part of value as has been created or maintained by money furnished by them. "To sustain the Commission's construction," the court said, "would be to hold that a utility's system could earn money for its owners only on its depreciated value, which would become less as depreciation increased, with an eventual depreciation equal to the actual value. The confiscatory result of a system without earning value to the owners would thus ensue."

Depreciation reserve is not an addition to capital. Broadly speaking, it is the loss, not restored by current maintenance, due to all the factors causing the ultimate retirement of the property, including wear and tear, decay, inadequacy, and obsolescence.

In rate making, it is proper to include in the operating expenses (that is, the cost of producing the service) an allowance for consumption of capital to maintain the integrity of the investment.

Depreciation has also been defined as "the loss in service value not restored by current maintenance and incurred in connection with the consumption or prospective retirement of property in the course of service from causes against which the utility is not protected

by insurance, which are known to be in current operation, and whose effect can be forecast with a reasonable approach to accuracy." (Depreciation Charges of Telephone Companies, 177 I. C. C. N. 351, 422.) The depreciation fund adds nothing to capital investment, but only maintains it. The right to the owners of the utility that their investment shall not be impaired predicates the right of return from it on the basis of non-impairment. A utility's accrued depreciation is to be treated as an asset belonging to it by force of the State and Federal Constitutions.

In the estimate of cost of a reproduced plant or of the cost of the present plant on the basis of present-day prices, a depreciation allowance for present conditions of the plant must be made to equalize the difference between old and new. The statement in the court's opinion that depreciation reserve is an asset of the utility was made to combat the Commission's erroneous theory that it belongs to the customers. If, by its use in maintenance, it adds to actual value the addition enures to the benefit of the utility.

Non-Metallic Garbage Cans

As metallic cans are not now available for garbage, many cities find it impossible to enforce regulations requiring their use and are looking for substitutes that will enable them to prohibit the use of any old box or basket for this purpose. Several substitutes are on the market, most of them using paper or wood as a base material. Pasadena, Calif., has prepared specifications for what it will consider satisfactory for such purpose, which are as follows:

Each such can or receptacle shall be constructed water-tight and shall be provided with handles and a tight fitting cover, and shall be constructed of one of the following materials:

(a) Galvanized metal.

(b) Continuously and tightly wound and cemented paper, consisting of not less than ten (10) plies or layers, and having a total thickness of not less than one-quarter of an inch.

(c) Plywood, having an over-all thickness of not less than three-sixteenths of an inch.

(d) A hardwood sheet with kraft paper facing on both sides with a total thickness of not less than one-eighth of an inch.

(e) Solid wood, with a thickness of not less than five-eighths of an inch.

In addition, the construction, if made from any of the above except type (a), shall conform to the following construction requirements:

(1) The material, if consisting of a combination of two or more sheets or plies, shall be accurately cemented together with a waterproof and acidproof adhesive cement or glue.

(2) The inside of the container shall be protected with a coating which is both waterproof and acidproof, and the outside shall be protected with a waterproof coating.

(3) Sufficient hoops, bands, or other protective devices shall be used to make the container sturdy and resistant to external blows.

Each receptacle shall be tightly covered except when garbage is being placed therein or removed therefrom and the receptacle shall be kept in a convenient place, easily accessible to persons engaged in the business of collecting garbage.

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Postwar Planning by Cities

Information concerning what cities are doing in planning for postwar work was collected by a committee of the International City Managers' Assn. through questionnaires last May. Replies were received from 92 cities, and were presented in the June issue of "Public Management." A summary of the information is as follows:

City managers of all but 10 of the 92 cities reporting in this survey are attempting to estimate or predict probable postwar conditions in their cities with regard to population, employment, conversion of war industries, and public works, and steps are being taken to meet these conditions. In the larger cities this planning activity usually is being carried on by the staff of the official planning agency, in the medium-sized cities by the city engineer's office, and in the smaller cities by the city manager. All of the cities over 75,000 have a planning agency, one-half of those in the middle-sized group, and one-fifth of the smaller cities. The planning agency is an advisory body, the planning work being done by the planning engineer, city engineer, or other administrative personnel under the supervision of the city manager. The initiative in the development of postwar plans is the responsibility of the city manager because he is the official who presents recommendations to the city council for action.

Nearly all the cities have already established a financial reserve for the postwar period, either by setting aside cash from surplus funds, investing surplus funds in war bonds, setting up depreciation accounts for replacement of equipment, streets, and utilities, or by paying off debt. No doubt many cities are anticipating federal financial assistance on public works projects, although only two specifically referred to this possibility, but apparently none of the cities have any thought of postponing development of plans until after the war.

Most city managers do not anticipate any transfer of services to other governmental units. However, several cities in each population group report that some or all health services are being transferred to the county. With regard to new or expanded services, the main emphasis seems to lie in the fields of recreation, garbage collection and disposal, sewerage facilities, and airport expansion. Finally, comparatively few of the 92 cities covered in this survey have experienced a large increase in population since 1940, because many of the smaller cities are either residential towns or do not have any large war industries. However, the officials of most cities would agree with the city manager who writes: "Unquestionably there will be an expansion in most of our present activities and services after the war."

Sewerage in Alabama

In Alabama there are 147 sewered communities, all using the separate system. Of these, 32 are privately owned, in communities 21 of which are under 1,000 population, 10 are between 1,000 and 3,000, and one is 10,000.

Of the 147 places, 81 (56% of all) have treatment plants, but only 15 provide secondary treatment, 5 having trickling filters, 8 intermittent sand filters, and 8 subsurface land disposal. Fifteen have separate sludge digestion; 29 have sludge beds—all open.

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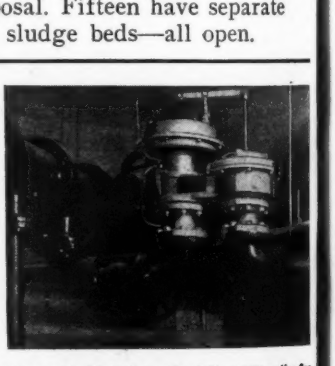

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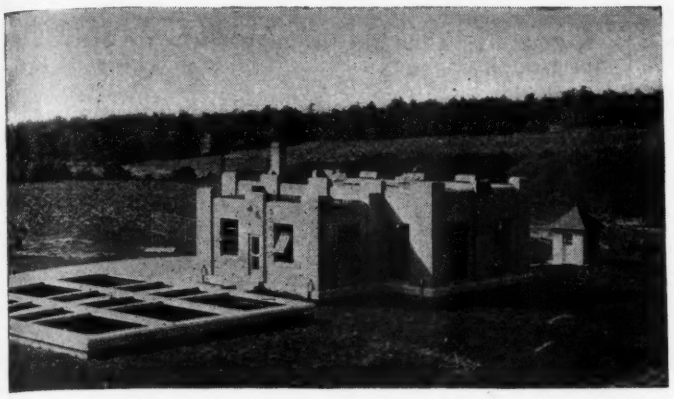


General view of filter and pumping plant, Oldham County, Kentucky.

The Waterworks Digest

Abstracts of the main features of all important articles dealing with waterworks and water purification that appeared in the previous month's periodicals.

Weatherproofing Atlanta's Water Plant

Last year Atlanta, Ga., rustproofed and waterproofed two of its filter plants, a 21 mgd concrete gravity plant 20 years old and an 18 mgd steel tank pressure plant 50 years old. The former included waterproofing 35,000 sq. ft. of concrete and rustproofing 27,500 sq. ft. of 2½" c.i. filter laterals, manifolds, and 200 gate valves. The latter included rustproofing 36 steel filter tanks, each 8 ft. diameter by 20 ft. long, and 425 valves. For both concrete and steel, they used "No-Ox-Id," a high melting paint wax containing rust inhibitors.

Sand and gravel were removed from both types of filters by means of a hydraulic sand ejector. In the gravity plant the 2½" filter laterals were cleaned inside and out by sand blasting, then dipped in hot coating material, drained and replaced. Concrete was cleaned of all loose particles, washed and dried and coated with 1/32" of No-Ox-Id applied hot by a special applicator, then the surface was gone over with the flame of a kerosene-burning torch. The 8" to 42" valves were cleaned with hand scrapers and power-driven brushes, then the entire internal surfaces were coated with "No-ox-Id A-Special" applied cold with a putty knife and gone over with a blow torch. There has been no leakage in the filter walls since.

For cleaning rust scale from the old tanks, an oxy-acetylene flame-priming torch, generating a temperature of 6,200° F, was used to dehydrate tenacious scale, which then was easily removed with chisels and power-driven wire brushes. Then the surface was dried by torch (using an oxidizing flame to prevent carbon deposits on the steel), the coating applied, smoothed with a torch and a second coat applied, giving a total thickness of about 1/16 in.

The 50-yr. old valves were badly tuberculated inside and hand scraping and power brushing failed to remove this, but sand blasting was successful. To prevent the sand cutting the bronze surfaces, these were first coated with "No-Ox-Id XX" which resists sand blasting.[G26]

Static Emergency Tanks for Fire Fighting

In England, water for fighting air raid fires is provided in all areas of high fire risk, so far as possible. Small water tanks scattered throughout the area and kept filled with water ("static tanks") are made of various materials. Some are rectangular, 5,000 to 7,000 gal. capacity, made of pressed steel plates bolted to steel base plates, laid on a bed of ashes or sand. For circular tanks of 7,000 to 22,000 gal. capacity, the cylinder is made of thin, flexible steel plates 8′ x 3′-11″, lapped 3″, the joint coated with asphalt, and bolted together. On a level base of 6:1 concrete 5″ thick, two rings of brick are laid, concentric and 2″ apart, and the tank cylinder set in this annular cavity, which is then filled to a depth of 1″ with 2:1 cement grout, and the remaining 2″ depth of groove, both inside and out, filled with bituminous grout. (In a few cases mischievous children have punched holes in these tanks.) Other tanks are built of brick; two concentric brick walls are built with a 2″ annular space between, the outer wall being surrounded with horizontal and vertical reinforcement; after which the annular space is filled with grout.

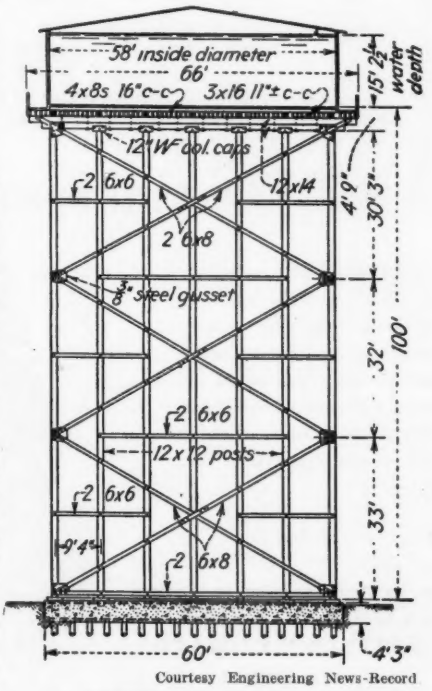
Sumps for pumps are set along stream banks, consisting of a 36″ concrete pipe 3 ft. long sunk into the stream bed and given a bottom of 6″ of concrete, and covered with two concrete slabs each 3′4″ x 1′8″.[D12]

Topeka's 2 M.G. Water Tower

Topeka, Kans., completed last January a 1,000,000 gal. concrete tank, 90 ft. diameter by 27 ft. high, supported on a concrete tower that extends 120 ft. above the ground surface and 30 ft. below it, the bottom 30 ft. also being used as a reservoir holding another 1,000,000 gal. The tank rests upon a horizontal slab across the top of the tower, which was finished carefully and covered with a thick layer of tar paper, on which the tank bottom rests, to separate the temperature stresses in the two. The tower consists of four concentric rings, the outside ring being 18″ thick and the others 8″. For both rigidity and beauty, the outside ring consists of a series of semi-circular vertical arches or grooves of 7 ft. radius.[J16]

Wood Stave Tank on Timber Tower

At several Army and Navy camps in California large wood-stave tanks on timber towers are being constructed. The first one, recently finished, consists of a 300,000 gal. tank, 58 ft. diameter by 16 ft. deep, on a tower 100 ft. high containing 49 timber columns, which are supported on a concrete mat 60 ft. square by 4 ft. 3 in. thick, which in turn is supported by piles. Stresses were calculated on an assumed horizontal force of 0.1 g. Tower diagonals are designed to take both tension and compression. The tower was designed as a vertical Warren



Courtesy Engineering News-Record

A 300,000 gal. wood-stave tank on a 100 ft. timber tower.

truss in which the panel points are the connections between the diagonals and the outer columns. The vertical columns are 12 x 12 timbers. The top girders are two 12 x 14 timbers. Each diagonal is a pair of 6 x 8's.[E15]

Fires in a Water Works Plant

Three fires have occurred in the steel activated carbon bunkers of the Milwaukee purification plant, apparently due to spontaneous combustion. They were readily controlled by carbon dioxide furnished by cylinders provided for general plant protection. Plans for the purification plant of a large eastern water company include a fire extinguishing system by which a concentration of 55% CO_2, held in a storage tank, is automatically discharged where its need is detected by thermostats.[J15]

Ground Water Exploration

In Illinois and Indiana, ground waters are the chief sources of supply for municipalities, and State departments and commissions are making intensive studies of them. In Illinois the State Geological Survey has been using methods novel as applied to ground water. Among them are studies of residues in hydrochloric acid, heavy accessory minerals, core analysis, and outcrop studies; and geophysical surveys, including electric and temperature logging, caliper surveys, resistivometer and current meter surveys.[A92]

The Illinois State Water Survey locates sources of water and investigates their capacities, sources, changes in composition, effect of pumping, etc. It has established that recession of groundwater levels threatens the continued usefulness of this source of supply.[A93] A special committee of the Illinois Section of the A.W.W.A. has suggested legislation for state control of well digging.[A94]

The Indiana Legislature in 1943 voted $15,000 annually for ten years for an investigation of the State's water resources by the State Conservation Dept., and more than $10,000 has been promised by the State Board of Health, Highway Dept. and other governmental agencies; and the U. S. Geological Survey will contribute $25,000. It is proposed to spend $30,000 for stream flow investigations, $15,000 for ground water investigations and $5,000 for investigations of the flow and levels of natural lakes.[A95]

Chlorination of Pasteurella Tularensis

P. tularensis, the causative agent of tularemia, is reported by several investigators to have been found in natural waters. A number of studies led to the conclusion that chlorination by means of a hypochlorite or with chlorine solutions in water will kill it or render it inactive, when the dose gives a residual chlorine content of 0.1 ppm after 15 min. contact; or 0.2 ppm after 30 min. in another series of experiments.[A91]

Removing Manganese In Durham, N. C.

Durham gets its water from a lake of 5 billion gal. capacity, in the bed of which is manganese-bearing rock which, by anaerobic decomposition, contributes to the stored water relatively large amounts of manganese. In 1941 this averaged 0.27 ppm and reached a maximum of 1.40 ppm. Maximums occur each year in the period between August and November. By using the permanganate oxidation method with a dose averaging 1.95 ppm, the manganese has, for 8 years, been reduced to 0.07 ppm.

But early in 1941 potassium permanganate crystals ceased to be obtainable and experiments were begun to find a substitute method. As a result of these, coagulation with "Ferrisul" and lime was adopted. About 20 to 40 ppm of ferric sulphate is mixed with the water for two minutes, then lime is added and mixed for about six minutes. For good manganese removal the pH must be

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kept at between 8.5 and 9.3—the higher the manganese content the higher the pH. If the water is soft and highly colored, it is difficult to remove both color and manganese simultaneously by this method; if the pH is high enough to remove the manganese it leaves a color of 15-20 ppm. High chlorine dosage along with the coagulants (followed by dechlorination) permitted removing both, and this method has been adopted. It costs only two-thirds as much as the permanganate method and removes the manganese more completely, but the finished water is harder.[G29]

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c. Indicates construction article; *n*, note or short article; *p*, paper before a society (complete or abstract); *t*, technical article.

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86. Plans and Policies of the Office of War Utilities. By J. A. Krug. Pp. 841-845.
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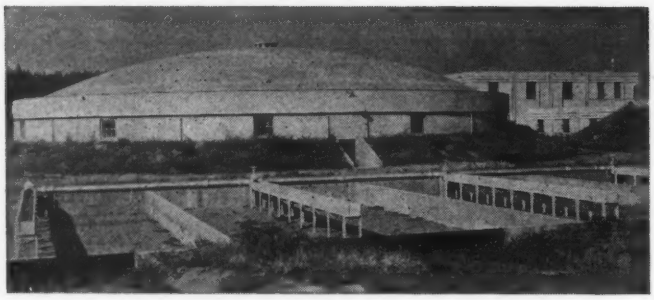


Brainerd sewage treatment plant. Concrete dome covers filter. Hitchcock & Estabrook, engineers.

The Sewerage Digest

Abstracts of the main features of all important articles dealing with sewerage and sewage treatment that appeared in the previous month's periodicals.

Activated Sludge Settling Tanks

The Bowery Bay treatment works, New York City, 40 mgd capacity, is an activated sludge plant with aeration tanks incorporating "step aeration" with 2.5 hr. detention, and final settling tanks with 1.7 hr. detention period, and unique in that the sludge is removed at the end opposite the incoming flow, while the effluent weirs are along the sides for 40% of the distance from the effluent end. So successful is this last that the next design will place the effluent with the effluent weirs close to the influent end of the tank. This is because the incoming sewage is heavier than the outgoing and flows along the bottom of the tank to the far end, meantime dropping its solids; then the lighter clarified sewage flows back through the top half of the tank. Therefore the sludge-removing flights move *with* the sludge instead of against it as in every previous tank; and the sludge leaves the tank within 15 min. after entering it and so fresh that returned sludge contains 1 ppm or more of dissolved oxygen.

The aeration tanks are spiral flow, divided into four passes. Return activated sludge is admitted at the head of the first pass, in which it is reaerated, and one-third of the settled sewage is admitted at the head of each of the other passes. Dissolved oxygen is held at about 1 ppm in the first pass and 3 ppm at the end of the fourth.[G13-L4*]

Treatment at Canada Air Schools

In providing sewage treatment at more than a dozen air-training schools in Western Canada in 1941, the "Clarigester" followed by low-rate trickling filters was adopted. Design was based on the assumption of 0.27 lb. per cap. per day of suspended solids, 0.17 lb. of B.O.D., and 0.09 of ether-soluble matter. Clarifier capacity was based on 2 hr. detention for average flow during a 16-hr. period, and the digester provided 1.5 to 2 cu. ft. of space per person. Increase in numbers has reduced this capacity per capita to 1 cu. ft. The low-rate filters were designed at first for 500,000 gal. per acre-foot, later changed to 350,000 gal.; depth 5.5 to 6 feet. Grease traps at kitchens were not required at first; have since been added but are not satisfactory because not cleaned regularly.

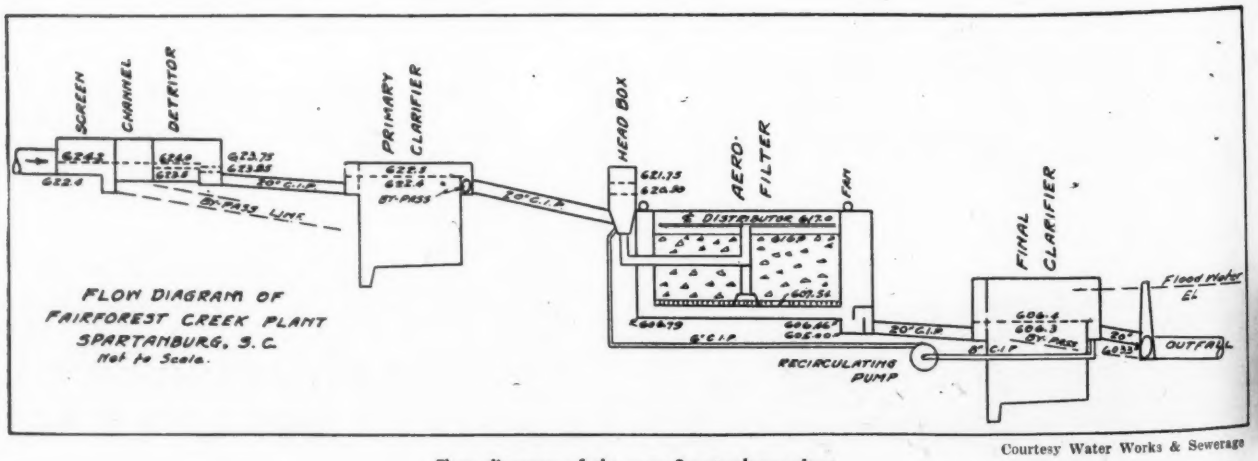
Trickling filters for 2,000 population or over are expensive because they have to be roofed over. In 1942 a biofilter plant was constructed at an airport in Newfoundland, several others are now in operation and a number are under construction. Recent designs are based on a recirculation ratio of 3:1. Dosing rates for filters range between 12 and 25 mgd. Underground filters are not considered practicable for Western Canada. Sludge digestion tanks should always be heated. Clarigesters do not need to be covered, but sprinkling filters do. Septic tanks may be considered for 750 population or less; 2-story tanks and low rate trickling filters for 750 to 2,000; biofilters for 1,500 to 2,000 or more.[M5*]

Enlarging a Treatment Plant

Spartanburg, S. C., in 1940 had a population of 50,000. In 1941 Camp Croft was established 4 miles east, and arrangements were made with the Army to treat its 1 mgd of sewage at one of the city's two plants—Fairforest Creek, with a rated capacity of 3 mgd. But by the fall of 1941 the camp sewage reaching this plant exceeded 1.5 mgd and the city sewage 2.0 mgd, with peak flows of 5 mgd almost daily.

The plant consisted of bar screen, double primary clarifiers, trickling filters, final clarifier, 3 sludge digesters, and sludge drying beds. An additional 2 mgd plant was constructed, under the auspices of the Army and FWA, consisting of primary clarifiers, aero-filter, final clarifiers, digestion tank and drying beds. An 8 mgd Dorr "detritor" to handle the entire flow replaces the old hand-cleaned grit chambers. As the aero-filter requires high flow at all times, the bulk of the night flow is diverted to this from the old plant to reduce the amount of recirculation necessary. The clarifiers are provided with Rex sludge collectors and revolving scum pipes in final as well as primary clarifiers. The 700 gpm recirculation pump is controlled by a float switch at the

*See Bibliography in the July issue.



Courtesy Water Works & Sewerage

Flow diagram of the new Spartanburg plant

head box of the filter, to start the pump when the sewage flow falls below 1150 gpm and stop it at 1850. Two 2770 cfm blowers are provided for ventilation, pulling air down through the filters. The filter distributor is the revolving type with 10 arms, each bifurcating at midpoint, with centrifugal sprinkler nozzles. A screenings "Triturator" is provided. The old and new digesters combined give a capacity of 3 cu. ft. per capita.[G16]

Cleaning Diffusion Plates

Clogging is inherent in all diffusers used in sewage aeration. This necessitates higher air pressure and consequent increased cost for power. As a rule it is economically sound to begin cleaning diffusers when the loss of head has increased 0.5 lb., varying somewhat with the cost of power at the plant in question. At the Cleveland Easterly Plant (experience at which is the basis of this article), this cost is 6.7 mills per kwh. The diffusers are Aloxite plates in Burger removable cast aluminum manifolds. Cleaning studies were made using various solutions, such as caustic soda, gasoline, muriatic acid, nitric acid and chromic acid. The solution adopted was a 2% solution of sodium dichromate in sulphuric acid. When there was considerable grease, a strong caustic soda solution was used first.

Cleaning consisted of three steps: 1—Soaking the plates for several hours in this solution; 2—Allowing the solution to drain out of the plates; 3—Thoroughly scrubbing the plates with compressed air and water. The last is very important; rinsing in even 6 baths of water did not remove all of the residue from cleaning, which penetrates the interstices. A special machine was devised for scrubbing, using water at 70 lb. per sq. in. and air at 8 lb. pressure. During 1942, 4800 plates were cleaned and restored to within 90% of their original porosity, at an average cost of 45 cts. per plate, of which 36 cts. was for labor in removing, cleaning and replacing, and 9 cts. for acids and miscellaneous. A method of cleaning and scrubbing the diffusers without removing them would save much of the labor cost, and a portable apparatus for doing this would find almost universal use in plants using diffused air.[G13]

Curing Bulking By Chlorination

For nine years Lima, Ohio, has used chlorine only, with uniform success, for curing bulking. Application is begun when signs of the onset of bulking appear; chlorine should not be used to *prevent* bulking. Best results seem to be obtained by using 8.5 ppm of chlorine for each percent of solids in the returned sludge. With the plant operating daily in excess of its rated capacity, application of chlorine to the returned sludge has prevented any sludge going over the final weirs. In applying the chlorine it passes through a Rotameter and, mixed with water, is pumped by an ordinary glass laboratory vacuum pump, through garden hose, to a point on the return sludge line between the final tanks and return sludge pump. The cost is more than offset by the reduction in power required for air compression.[G14]

Sewage Plant Operation Taught by Model

A model of a biofiltration plant on a scale of ¼ in. to 1 ft. has been planned and built by engineers of the Repairs and Utilities Branch, Office of the Chief of Engineers, under the direction of the Bureau of Public relations, War Dept., to be used by the Corps of Engineers in explaining construction details at short courses for supervisors of sanitary engineering utilities; at courses given by state organizations in which Army plant operators participate, and at post engineer schools conducted by the service commands. The plant consists of grit chambers, Parshall flume, bar screen, sewage pumps, primary

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and secondary clarifiers, primary and secondary biofilters, recirculation pumps, two-stage digestion system and sludge drying beds. Several units are shown in cut-away sections. A transparent panel in the ground surface shows the underground piping, and glass sides allow further inspection of underground facilities. The design is based on an assumed population of 5,500 and the standard requirements for a permanent army post. A color scheme of the piping helps to follow the flow through the plant.[E15]

Rendering
Sewage Grease

Grease in sewage at treatment plants is a nuisance. At the Denver, Colo., plant the grease collected averages ¼ lb. per person per month, at which rate 20,000,000 lb. per month reach this country's treatment plants; which would yield 750,000 lb. of glycerine. The grease is of inferior grade, and most of the plants collect relatively small amounts, so rendering plants do not want it. But sewage plants could render their own and store it until enough is collected to pay for shipment; for once rendered, the grease would not become rancid. The equipment at a small plant could consist of a low-pressure boiler and two or three metal tanks, one equipped with steam coils for rendering, the others used for settling. Larger plants could have a hot filter press also.[H32]

Heating
Digestion Tanks

"The technical solution of sludge digestion tank heating problems involves the same fundamental technique used in the solution of other heating and heat transmission problems." However, sanitary engineers tend to ignore this and use empirical values which have not been adequately substantiated, which has resulted in furnishing too little or too much heat in some installations. To aid in making technical calculations for individual tanks, the author discusses at length the theory and practice of such heating under five heads: Heat losses from a digestion tank; Heat required by fresh sludge additions; Methods for heating tanks; Digestion tank heat exchangers; and Selection of heating equipment.[G15]

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c. Indicates construction article; *n*, note or short article; *p*, paper before a society (complete or abstract; *t*, technical article.

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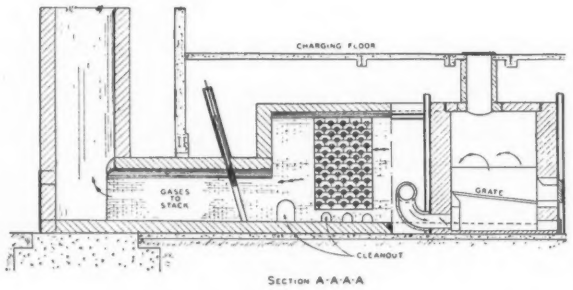

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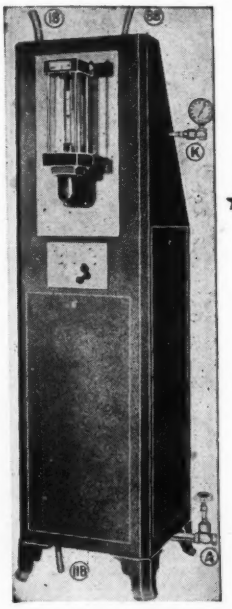

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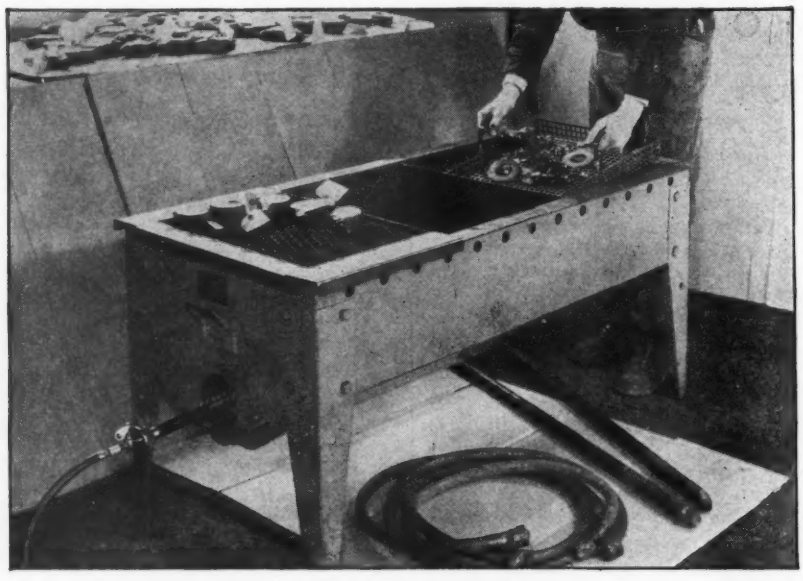


Littleford Bros. Model 19 Processing Pan.

Model No. 19 Processing Pan—A "War Baby"

Littleford Bros.
453 East Pearl St., Cincinnati, 2, Ohio

On practically all war contracts, whether they call for complete equipment or spare parts, the prime contractor is now required to "process" all metallic surfaces. This is to prevent rust created by salt water, salt air or long periods of exposure to rain, snow, etc. This "processing" job was dumped into the manufacturers' laps recently, and was a tough nut to crack. To handle it, Littleford Bros. developed the Processing Pan with gas burner, 7 ft. length rubber gas hose, two compartments, and one dipping basket with handle. The pan can be supplied in three compartments, caster wheels, and a flat top cover with two handles, if desired. It does a swell job of melting the wax sealer and heating the rust-inhibiting oil required by War Department regulations.

Osmoplastic, a Wood Preservative

Osmos Wood Preserving Co.
1437 Bailey Ave., Buffalo, N. Y.

This is a scientific preservative containing the highly toxic and time-tested Fluoride-Phenol-Chrome salt combination known as "Osmosalts," suspended in a coal tar creosote body. The coal tar creosote acts as an external toxic armor, obstructing moisture—while the Osmosalts are dissolved and diffused deeply into the wood. This combination of preservatives thereby provides dependable double-protection against decay.

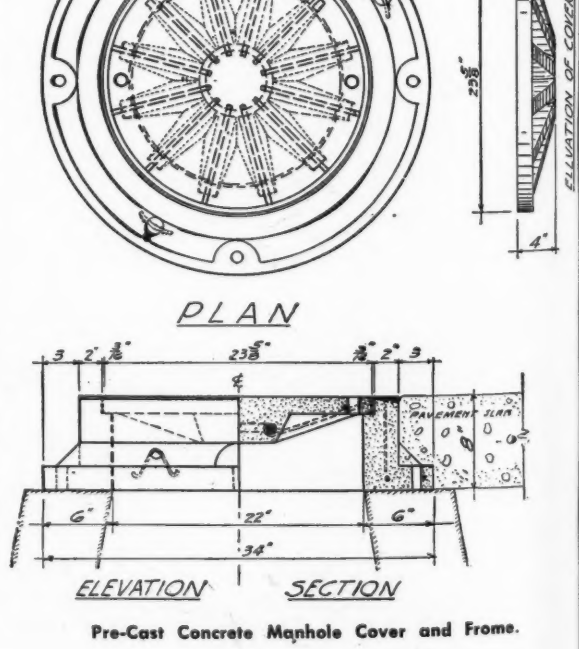
Applications of Osmoplastics include: Bridge Timber, Piling, Highway Guard and Sign Posts, Telephone and Lighting Poles. It is easily applied at the points where decay always occurs. Descriptive literature is available.

Pre-Cast Concrete Manhole Fittings

United Concrete Form Products Co.
101 Park Ave., New York, N. Y.

In form, this manhole cover is essentially a king post truss, giving maximum load carrying capacity for the amount of steel and concrete which it contains. Attachment of the radial reinforcing rods to the inclosing channel rim is an important detail, contributing much to the strength of the cover by bringing the high compressive strength of the concrete into play under load. It also makes possible the relative thinness of the edge and the relative light total weight of the cover. This rim serves the additional purpose of preventing chipping of the corners of the cover from traffic wear and especially from the rough handling which the cover usually receives when manholes are opened.

The cover and frame as shown by the accompanying details are designed to carry the heaviest wheel loadings permitted on highways (16,000 pounds plus 25% for impact). Tests have shown that their actual load carrying capacity is considerably in excess of requirements. From the drawing, it will readily be seen that the unusual strength of the cover depends largely upon the excellence of the welding which is involved. Write for folder giving full information and specifications.



Pre-Cast Concrete Manhole Cover and Frome.

"Profits from Sewage Sludge"

Royer Foundry & Machine Co.
Kingston, Pa.

The fertilizing values in sewage sludge are explained and a list of crops and plants which, according to competent authorities, have benefited by the application of fertilizer made from sewage sludge is presented.

The bulletin explains how sludge cake from the drying beds is shoveled into the hopper of this machine, which thoroughly shreds, mixes, aerates and further dries the sludge, reducing it to pea size and removes sticks, stones and other trash. The machine discharges onto pile or truck a high grade marketable fertilizer. Where a high strength fertilizer is desired, enriching chemicals can be mixed with the sludge by this machine.

The bulletin further shows how the sludge disintegrator is used at city parks and golf courses for mixing top dressing and also at schools for mixing materials for walks and athletic grounds.

The twelve stationary and portable models of the machine—electric motor, gasoline engine or belt-to-tractor driven—are illustrated, with specifications

which show a model of proper capacity for a city of any size.

A copy of the bulletin may be obtained by writing the manufacturers.

Saran Thermoplastic Pipe

Acadia Synthetic Products Division
Western Felt Works
4115 Ogden Ave., Chicago

Saran pipe is made of a chemically resistant thermoplastic resin (a product of Dow Chemical Co.) and is now available in sizes from ½" to 4" with a complete line of fittings for all sizes up to 2". Among its outstanding characteristics are toughness, durability and resistance to corrosion. It can be threaded with standard pipe threading tools, hand or power driven, and welded. Because of its many unusual properties, the manufacturers say Saran pipe is destined to play an outstanding role wherever service requirements are too severe for other materials. Weight of Saran pipe is approximately ¼ of that of comparable sizes of iron pipe. Information on where to use Saran pipe, how to weld and thread it, weights and bursting pressures are given in a folder which is available upon request.

New Pittsburgh-National Meter Bulletin

Pittsburgh Equitable Meter Co.
400 Lexington Ave., Pittsburgh, Pa.

A new bulletin, W-539, describing the complete line of Pittsburgh-National Iron Case Cold Water Meters has recently been issued. Cataloged therein, with complete specifications, are the following: The Empire Victory Meter, sizes ⅝ and ⅝ x ¾"; The Empire Type 9 Meter, sizes ¾ and 1"; Empire Large Capacity Meters, sizes 1½" through 6"; Pittsburgh Ironside Meters, sizes ⅝" through 2"; Gem Velocity Meters, sizes 2" through 12", and Empire Compound Meters, sizes 3" through 12".

It is stated by the manufacturer that all these meters are built in accordance with the W.P.B. Limitation Order and that they provide a complete range of sizes and types to handle any measurement need, and that any of the company's bronze case meters can still be furnished upon proper end use allocation for the Army, Navy, Maritime Commission and Lend Lease.

Copies of this Bulletin can be obtained by addressing the company.

Excavator Maintenance Booklet

Bucyrus-Erie Co.
South Milwaukee, Wis.

A new booklet "Ideas to help you keep your present excavators working and doing more to win the war," free to owners and operators of shovels, cranes and draglines is announced by Bucyrus-Erie Company.

Containing no advertising or extraneous material, this 32-page, 5½ x 8½ booklet, attractively illustrated and printed in two colors, is packed with practical, experienced-tested suggestions on how to maintain maximum excavator production. More than 100 brass-tack tips on the proper operation and care of excavators, regardless of make, are given under the following headings: Old and New Ideas for Short Cuts and Savings; Suggestions for the Boss; Suggestions to the Operator; Adjustments; Keep Lubrication Clean; Lubricate Regularly; Prompt Repairs Save Time, Work, Money; Short Moves Often Dig More Dirt; Keep Power Plant Humming; Shove Up Your Shovel Output; Special Helps to Better Dragline Performance; Hints that Help to Increase Crane Output; Safety First.

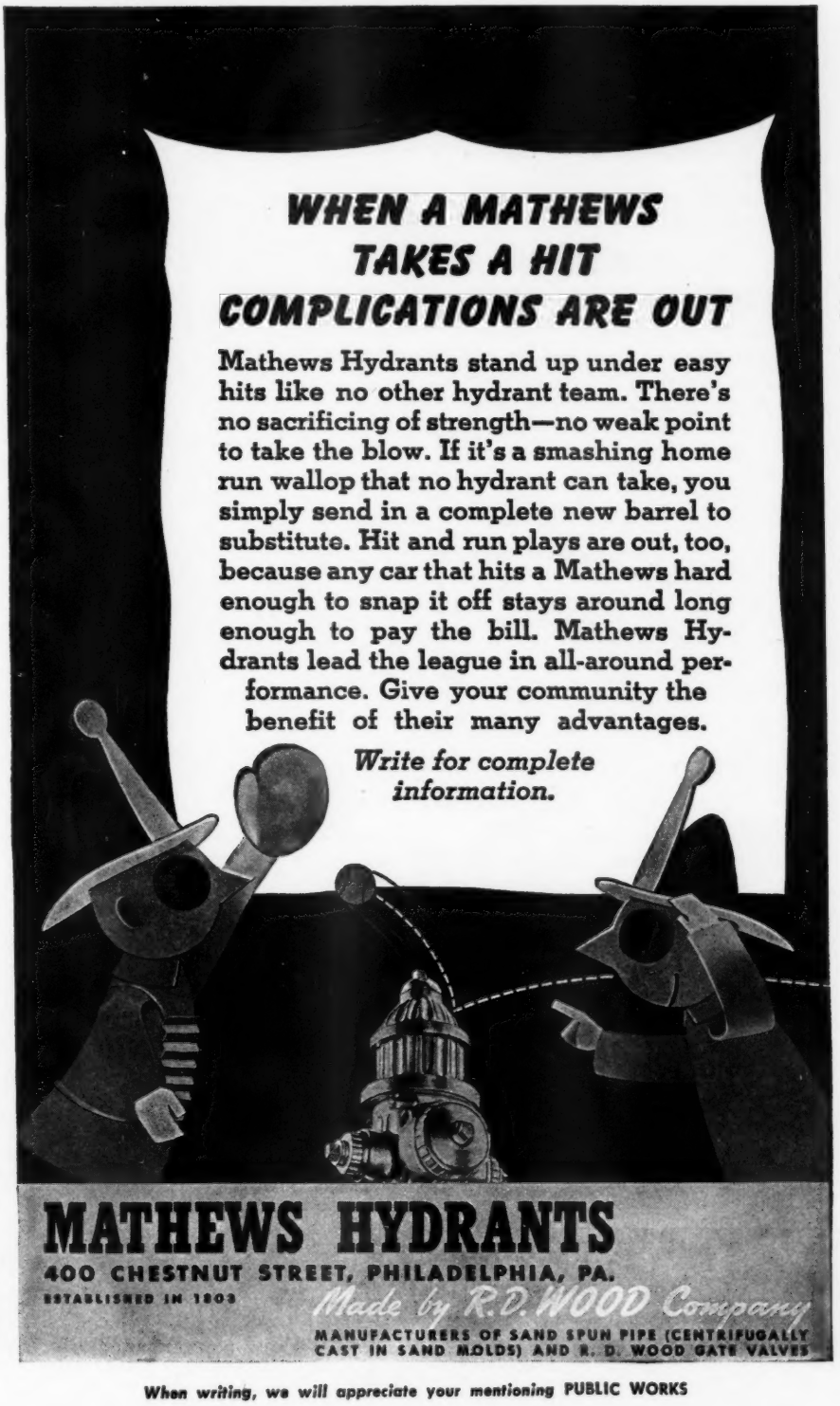
Copies may be secured by writing Publicity Dept., Bucyrus-Erie Co.

"Electronics at Work"

Westinghouse Electric & Mfg. Co.
East Pittsburgh, Pa.

Electronics applications in industry, in the war, in medicine and the home are illustrated and described in a new 44-page booklet, B-3264, announced by Westinghouse Electric and Mfg. Company.

A few typical applications shown in this booklet "Electronics at Work" are: resistance welding control for sewing plane parts together at 1800 stitches per minute; cathode ray oscillograph for electrical circuit and lightning phenomena analysis at speeds of 1/100 of a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Mathews Hydrants stand up under easy hits like no other hydrant team. There's no sacrificing of strength—no weak point to take the blow. If it's a smashing home run wallop that no hydrant can take, you simply send in a complete new barrel to substitute. Hit and run plays are out, too, because any car that hits a Mathews hard enough to snap it off stays around long enough to pay the bill. Mathews Hydrants lead the league in all-around performance. Give your community the benefit of their many advantages.
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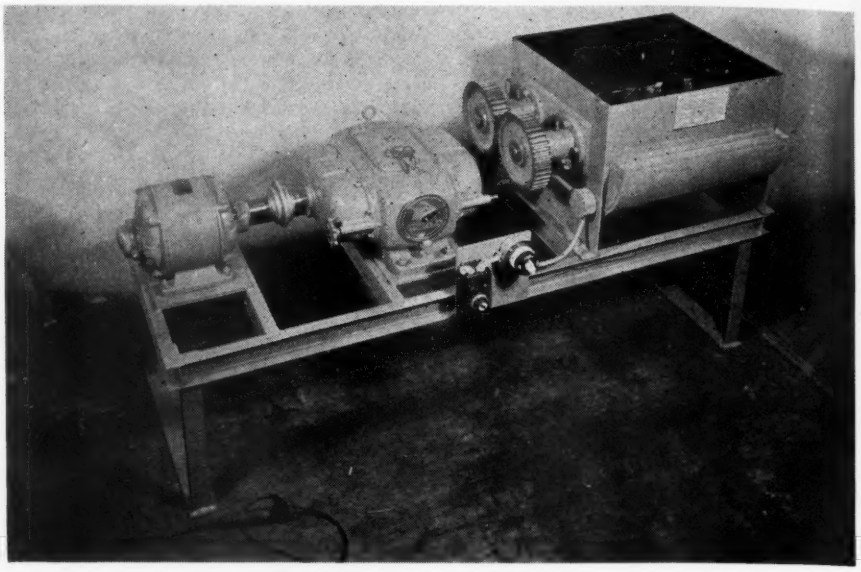

Iroquois Laboratory Pug Mill Mixer.

millionth of a second; high-frequency induction heating units for plastic molding; tin reflowing and surface hardening; ignitron rectifiers for converting alternating to direct current in aluminum and magnesium production; industrial X-ray units for "inside" inspection of vital metal parts; Precipitron for removing air-borne dust particles as small as 1/250,000 of an inch.

Iroquois Laboratory Pug Mill Mixer

Lancaster Iron Works, Iròquois Division Lancaster, Pa.

The curtailment in the use of asphalt last summer for road construction, as a result of the War, caused the Pennsylvania Department of Highways to undertake an immediate research program utilizing paving materials more readily available. This work was conducted at the Department of Highways Laboratory in Harrisburg, Penna. by H. S. Mattimore, Engineer of Tests and S. A. Bloom, Advanced Research Engineer.

In order to prepare mixtures in accordance with accepted and standard plant practices, they used a Two Cubic Foot Capacity Iroquois Twin-Shaft Laboratory Pug Mill Mixer.

This mixer is equipped with twin shafts of a unique design to facilitate quick removal for rapid cleaning and to permit readily changing the blade arrangement. Stub shafts, mounted in LINK-BELT Series 2227 Babbitted Flanged Bearings, extend through the mixer shell and are equipped with Neoprene Seals to prevent leakage of material at this point. The stub shafts are equipped with flanges, to which flanges on the mixer shafts are fastened by two machine screws. By removing these screws, the shafts can be lifted out of the mixer. This obviates slotting the mixer shell and the necessity of installing gap plates. Each shaft is equipped with welded reinforced steel blades furnished in three shapes — square ends for fine or topping mixes, pointed ends for coarse or binder mixes, and rounded ends for either fine or coarse mixes. Each shaft is extended at one end on which are mounted cut tooth twin gears. Mixed material is discharged through an opening in the bottom of the mixer which is closed by means of a welded steel slide operating on slide rails.

Since the Pennsylvania Department of Highways desired to produce hot mixtures as well as those of the cold type, the mixer is equipped with electric strip heaters which are bolted to the outside of the mixer shell and covered by an insulated jacket. Temperature is controlled by means of a three heat switch and thermostat with manual control.

Calcium Chloride for Dustproofing

Wyandotte Chemicals Corp., Michigan Alkali and J. B. Ford Divisions, Wyandotte, Mich.

In a folder of the above title, practical hints are given for the application of calcium chloride in order to secure the best results. Other useful information is given on "How to Figure What You Need" and the amount to use per

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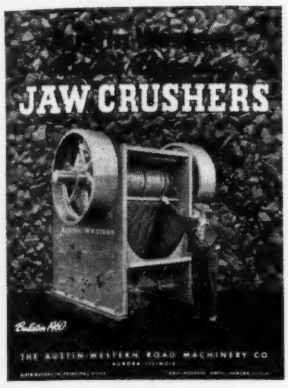
A KNOTT HOTEL . . Dorothy Reed, Mgr.

square yard for use both as a binder and for dustproofing. Copies available upon request.



New Crusher Bulletin

Austin-Western Road Machinery Co. Aurora, Ill.

The complete line of roller bearing jaw crushers offered by The Austin-Western Road Machinery Co., is presented in a new 8½ x 11 eight-page bulletin that has just been released. All features of construction and operation are clearly illustrated and completely explained. It also includes large cross section views of complete crushers, bearings, etc., and gives a very comprehensive conception of detailed design and performance. Operational data, specifications and dimensions are also provided and arranged for easy reference. This new piece of literature, known as Bulletin 1960, is available at any Austin-Western Distributor or can be obtained by writing the company direct.

Johns-Manville Promotes J. G. Walker

James G. Walker, prominent in the civil and structural engineering field, has recently been appointed Manager of the Transite Asbestos Pipe department for the New York sales district of Johns-Manville.

Mr. Walker assumed his duties on June 16. His technical training includes two years at Holy Cross University, and four years at the Massachusetts Institute of Technology, where he specialized in architectural engineering.

Subsequently he served as engineer for several large construction companies, and for the Portland Cement Association.

In 1928, he was employed by the Alpha Portland Cement Company in an engineering sales capacity until joining Johns-Manville.

Fosburg Joins Wyandotte Chemicals

Robert L. Fosburg, formerly with the Calcium Chloride Association, is now connected with the Wyandotte Chemicals Corporation, Wyandotte, Michigan, in the Special Products Division.

New Sales Engineers for the Vapor Recovery Systems Company

Clifford T. Stanhope is in charge of the "VAREC" Eastern office and warehouse, 30 Church Street, New York City. Mr. Stanhope has a wide experience in Petroleum, Chemical, and Pipe Line Activities. F. F. Tentschert, a Sanitary Engineer of wide experience, will assist Mr. Stanhope in the Sewage and Marine Divisions of the Vapor Recovery Systems Company.

Frank M. Holloway, member of A.S.M.E. and formerly Eastern Sales Manager, is now Southeastern Sales Manager with headquarters at New Orleans, Louisana.

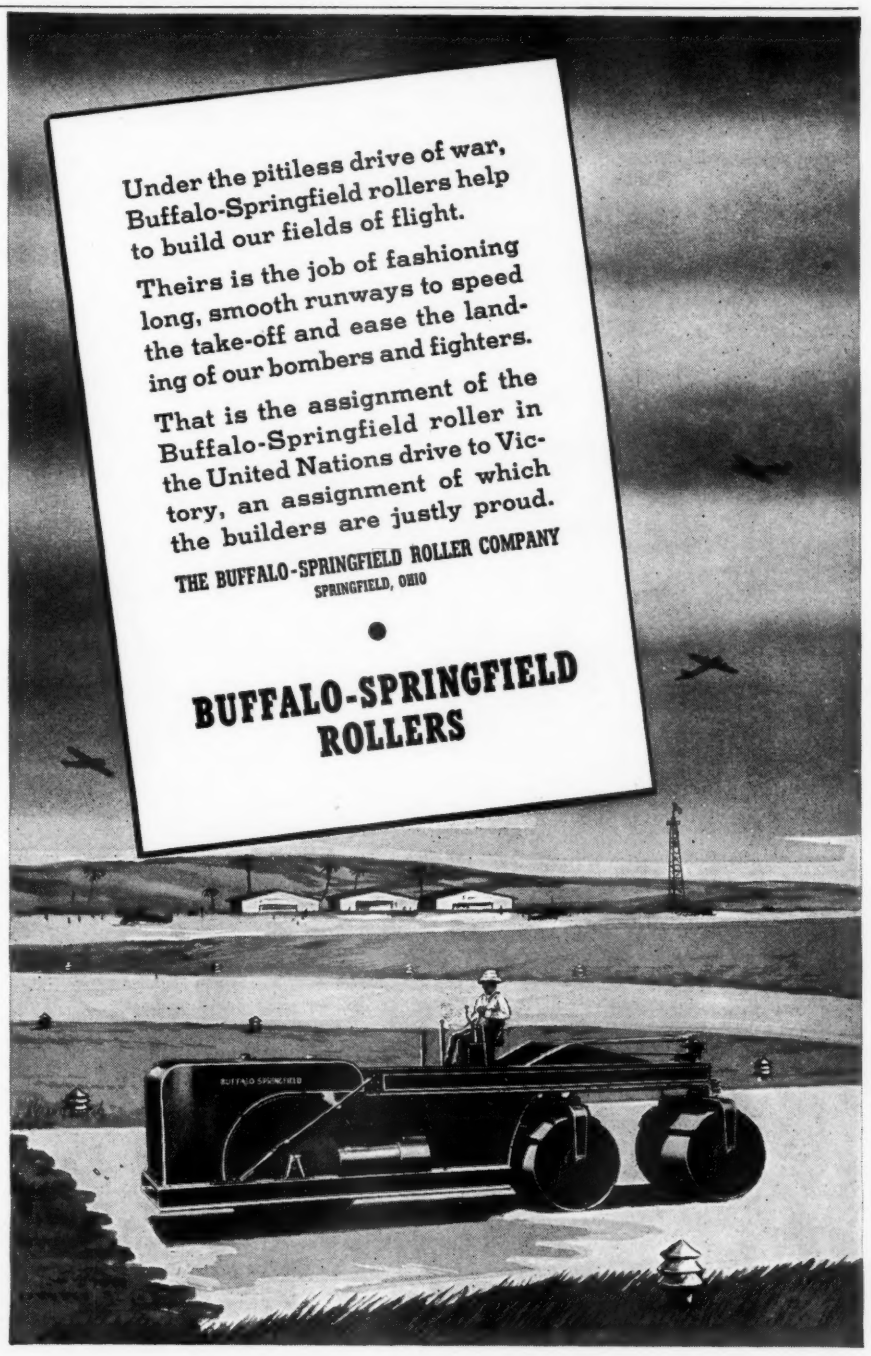
John L. Shaunty has been appointed manager of Mid-Continent Sales, Distribution and Service. He will have complete charge of both Houston and Tulsa offices and warehouses.

A. J. Foley & Company, 7309 East End Avenue, Chicago, represents "VAREC" in the Great Lakes Area for Sewage and Marine Equipment.

These appointments are in line with the large building and expansion program instituted by Frank V. Long in 1941.

Federal Works Agency Now at 101 Park Ave., New York N. Y.

Regional Director John M. Gallagher of the Federal Works Agency announced today removal of the regional offices from 2 Lafayette Street to the 15th floor of the Architects' Building at 101 Park Avenue, New York, N. Y. FWA Region No. 1 embraces supervision of the Agency's war public works and war service projects in New England, New York, New Jersey and Pennsylvania.


Under the pitiless drive of war, Buffalo-Springfield rollers help to build our fields of flight.
Theirs is the job of fashioning long, smooth runways to speed the take-off and ease the landing of our bombers and fighters.
That is the assignment of the Buffalo-Springfield roller in the United Nations drive to Victory, an assignment of which the builders are justly proud.
THE BUFFALO-SPRINGFIELD ROLLER COMPANY
SPRINGFIELD, OHIO
BUFFALO-SPRINGFIELD ROLLERS

First Midwest Award of the Army-Navy "E" by the Medical Corps, U. S. Army, Won by Cleaver-Brooks Company

On May 28, 1943, the Medical Corps, U. S. Army, awarded the Army-Navy "E" to the Cleaver-Brooks Company, Milwaukee, Wisconsin. This is the first midwest manufacturer to be so honored by the Army Medical Corps. The award was conferred "for outstanding accomplishment in the production of materials needed in the war effort."

Long known as builders of oil-fired steam generators and portable heating equipment for road oils and bituminous materials, Cleaver-Brooks Company is manufacturing special heating equipment for the use of our armed forces in the field for disinfecting, sterilizing, water-distilling, bathing and other important hygienic needs. Hundreds of their standard Tank Car Heaters are in service with the Corps of Engineers.

Stars Added to W & T "E" Flags

A continued level of outstanding production achievement has earned for both Wallace & Tiernan Company, Inc., and Wallace & Tiernan Products, Inc., the addition of the star to their two previous Army-Navy "E" awards.

Experience in the manufacture of water purification equipment in peacetime has been applied by Wallace & Tiernan Company, Inc., in building war products to safeguard the health of troops in camp and in the field.

Maritime "M" to Lynchburg Foundry

On July 9th the Lynchburg, Va. plant of Lynchburg Foundry Co. and on the 10th the Radford plant of that company were awarded the Maritime "M" Awards.

Climax Engineering Wins "E" Award

The Army-Navy "E" Production Award has been presented to the employees and management of the Climax Engineering Company, Clinton, Iowa, in recognition of Climax's high achievement in the production of war equipment.

Association Meetings

September 28 and 29 — NEW ENGLAND WATER WORKS ASSOCIATION, Hotel Statler, Boston.

October 11-13 — SOUTHWEST SECTION A.W.W.A., Biltmore Hotel, Oklahoma City.

October 21-23— FEDERATION OF SEWAGE WORKS ASSOCIATIONS, Sherman Hotel, Chicago.

October 27-29— CALIFORNIA SECTION A.W.W.A., Biltmore Hotel, Los Angeles.

New England Sewage Works Fall Meeting at Parker House, Boston

Following the business meeting on September 22nd there will be a symposium on problems in the design and operation of very small sewage disposal plants to be opened by Mr. Frank L. Flood of Boston, Mass. Representatives of the State Health Departments of Connecticut, Massachusetts, and Rhode Island will also discuss this subject. City Health Departments in New England are invited to send their sanitary inspectors for this symposium.

Another symposium will be on the operation and design of high rate trickling filters. This will be opened by Samuel M. Ellsworth, consulting engineer of Boston, Mass., and Army officials having experience with this type of filter will also be invited to take part.

The operators' section has been tentatively set up to include the following subjects: 1. *Servicing of gas burning equipment.* 2. *Best size openings for bar screens.* 3. *Wire for vacuum filter cloths.* 4. *Maintenance of booster pumping stations.* 5. *Suitable kinds of lime to use for sludge digestion and Imhoff tanks.*

Annual Election of Water and Sewage Works Manufacturers Assn.

The following officers were elected at a meeting of the Board of Governors, held at Cleveland, June 17, 1943, for a period of one year, effective November 1, 1943: Charles A. McGinnis, *President;* Charles H. Becker, *Vice President;* Edgar J. Buttenheim, *Treasurer.*

New members on the Board of Governors and the Water Works Division and Sewage Works Division Executive Committes, elected for a three-year period effective November 1, 1943:

Board of Governors—The Dorr Company, Inc.; Hersey Manufacturing Company; Lock Joint Pipe Company; National Water Main Cleaning Company; Pittsburgh Equitable Meter Company.

Water Works Division Executive Committee—Industrial Chemical Sales Division, West Virginia Pulp & Paper Co.; PUBLIC WORKS MAGAZINE; Wallace & Tiernan Co., Inc.

Sewage Works Division Executive Committee—American Well Works; Pacific Flush-Tank Company; Wailes Dove-Hermiston Company.

Annual Planning Conference at M. I. T.

A two-weeks Conference on City and Regional Planning will be held at the Massachusetts Institute of Technology from September 7 to 18, 1943. The Conference, sponsored jointly by the Institute and the American Society of Planning Officials, is open to public works administrators and engineers, planning technicians, members of state or municipal planning commissions and housing authorities. Applications should be sent to Professor Frederick J. Adams, Division of City Planning, Massachusetts Institute of Technology, Cambridge, Mass.

Zechariah Chafee

Zechariah Chafee, President of Builders Iron Foundry, Providence, R. I., passed away at his farm near Tau

(Continued on page 58)

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PLAN NOW . . .
TO SAVE TIME, LATER
Even though war restrictions may defer your obtaining new equipment, we will be glad to help you work out the details of your needs now—for future action.
Write for Bulletin 23-B-12.

Three heavy-duty "R-C" Blowers providing economical aeration in the city of Peru, Indiana, sewage treatment plant. Two are V-belt driven from electric motors, and one is direct connected to gas engine. Capacity of each, 800 c.f.m.; pressure 8½ lbs.

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308 VALLEY AVENUE CONNERSVILLE, IND.

Roots CONNERSVILLE SINCE 1854 Aerating BLOWERS

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Readers' Service Department

These booklets are FREE but distribution is restricted to those actively engaged in engineering or construction. Use the coupon below or write the manufacturer direct, mentioning PUBLIC WORKS.

Construction Materials and Equipment

Air Raid Shelters

3. New 8 page booklet pictures and describes a corrugated pipe shelter with gas tight end walls, emergency escape tunnel and other desirable features. Armco Drainage Products Assn., Middletown, Ohio.

Bridges

7. Teco Connectors, a new method of structural engineering, to spread the load on a timber joint more equally over the cross-section of the wood is described in new literature available from Timber Engineering Co., Dept. BS-2, 1319—18th St., N. W., Washington, D. C.

Cement Dispersion

9. "Economics of Cement Dispersion and Pozzolith" tells the complete story of how cement dispersion reduces water required up to 20% and increases workability 150%. Write The Master Builders Co., Cleveland, Ohio, for a copy.

Cold Mix Plants

15. New catalogs and prices of Portable Bituminous Mixers in 6 to 14 ft. sizes for resurfacing and maintenance. Issued by The Jaeger Machine Co., 400 Dublin Ave., Columbus, Ohio.

Cold or Wet Weather Construction

18. Cleaver Aggregate Heaters and Dryers, Hot Water Boosters, and Automatic Steam plants are designed to speed up cold or wet weather construction. Write for illustrated bulletins. Cleaver-Brooks Co., 3112 W. Center St., Milwaukee, Wis.

Concrete Accelerators

31. New 48-page booklet in five sections explains clearly the effects, advantages and methods of using Calcium Chloride and Portland Cement mixes. Complete and packed with practical information; well illustrated; pocket size. Sent free on request by Solvay Sales Corp., 40 Rector St., New York, N. Y.

Concrete Curing

33. 64-page manual of concrete curing with calcium chlorides. Complete, handy. Contains useful tables, well illustrated. Write the Columbia Chemical Division, Pittsburgh Plate Glass Co., Grant Bldg., Pittsburgh, Pa.

Concrete, Early Strength

38. 64-page manual tells how to speed up year 'round concreting, shows how to secure high early strength and greater workability at temperatures either below or above freezing. Contains many actual examples of practical concreting operations; well illustrated with more than 60 photos, charts, graphs and tables. Calcium Chloride Assn., Penobscot Building, Detroit, Mich.

Concrete Mixers

44. Catalog and prices of Concrete Mixers, both Tilting and Non-Tilt types, from 3½S to 56S sizes. The Jaeger Machine Company, 400 Dublin Ave., Columbus, Ohio.

Drainage Products

70. Standard corrugated pipe, perforated pipe and MULTI PLATE pipe and arches — for culverts, sewers, subdrains, cattlepasses and other uses are described in a 48-page catalog entitled "ARMCO Drainage Products," issued by the Armco Drainage Products Association, Middletown, Ohio, and its associated member companies. Ask for Catalog No. 12.

Forms, Steel

90. Steel forms for Highways, Sidewalks and Airports, to keep pace with ever changing conditions are covered in two new bulletins containing complete specifications. Write Heltzel Steel Form & Iron Co., Warren, Ohio.

Graders, Patrol

105. The Austin-Western 99M Power Grader with its powerful all wheel drive simplifies all construction and maintenance; handles difficult jobs with economy and efficiency; and does better work on grading, ditching, scarifying, snow plowing, loading, mixing, bulldozing, shoulder trenching and backsloping. Write for Bulletin 1946. Austin-Western Road Machinery Co., Aurora, Ill.

Mixing Plants, Asphalt

106. The Cleaver Asphalt Mixing Plant for an inexpensive plant mix and the Cleaver Tank Car Heater and Bituminous Booster are covered in illustrated catalogs sent on request by Cleaver-Brooks Co., 3112 W. Center St., Milwaukee, Wis.

Mud-Jack Method

107. How the Mud Jack Method for raising concrete curb, gutter, walls and street solves problems of that kind quickly and economically without the usual cost of time-consuming reconstruction activities — a new bulletin by Koehring Company, 3026 West Concordia Ave., Milwaukee, Wis.

Oil, Motor

109. "Here's Proof of Ring-Free Superiority," 32 pages, illustrated, outlines the principles of lubrication and explains how by simple tests you can measure the advantages of Macmillan Ring-Free Motor Oil. Write Macmillan Petroleum Corp., 530 West 6th St., Los Angeles, Calif.

Paving Materials, Bituminous

111. New "Tarvia Manual" is packed with useful data on how to build and maintain roads with Tarvia. Each step is illustrated with excellent action pictures, 64 pp. 103 ills. Write to The Barrett Div., 40 Rector St., New York, N. Y.

Pumps

120. Interesting new booklet tells how to lengthen the life of your pumps. Explains how a little care will save a lot of wear. Write today for your copy. Homelite Corp., 2403 Riverdale Ave., Portchester, N. Y.

121. New illustrated catalog and prices of Jaeger Sure Prime Pumps, 2" to 10" sizes, 7000 to 220,000 G.P.H. capacities, also Jetting, Caisson, Road Pumps, recently issued by The Jaeger Machine Company, 400 Dublin Ave., Columbus, Ohio.

123. New brochure by Gorman-Rupp Co., Mansfield, Ohio, illustrates and describes many of the pumps in their complete line. Covers heavy duty and standard duty self-priming centrifugals, jetting pumps, well point pumps, triplex road pumps and the lightweight pumps.

124. 16-page illustrated bulletin, SP-37, describes and illustrates complete C. H. & E. line of self-priming centrifugal pumps from ½" to 8", including lightweight models for easy portability. C. H. & E. Mfg. Co., 3841 No. Palmer St., Milwaukee, Wis.

Road Building and Maintenance

128. Motor Patrol Graders for road maintenance, road widening and road building, a complete line offering choice of weight, power, final drive and special equipment to exactly fit the job. Action pictures and full details are in catalogs Nos. 253, 254 & 255, issued by Gallon Iron Works & Mfg. Co., Gallon, Ohio.

Rock Drill Maintenance

130. New booklet presents through amusing cartoons useful hints on proper rock drill maintenance methods—what your men can do to get more work out of your tools with a minimum of expense for repairs and compressed air. Write The Cleveland Rock Drill Co., 3734 East 78th St., Cleveland, Ohio.

Rollers

133. New Tu-Ton roller of simple construction for use in rolling sidewalks along highways, playgrounds and other types of light rolling is fully described in a bulletin issued by C. H. & E. Mfg. Co., 3841 No. Palmer St., Milwaukee, Wis.

138. "The Buffalo-Springfield line of road rollers (tandem, 3-wheel, and 3-axle) are described in the latest catalog issued by the Buffalo-Springfield Roller Co., Springfield, Ohio."

139. "Ironeroller" 3 Axle Roller for extra smooth surfaces on all bituminous work. Booklet contains roller data and operation details. Hercules Co., Marion, Ohio.

140. This well-illustrated 16-page catalog describes the tandem, autocrat, cadet, and roll-a-plane rollers, and explains what each is intended to accomplish. Write Austin-Western Road Mach. Co., Aurora, Ill.

Rotproofing

145. Cuprinol, a rotproofing chemical that protects wood from fungi and insects, yet has no offensive odor, is non-poisonous, does not corrode metal and can be painted over. Get full details in booklet from Cuprinol, Inc., 7 Water St., Boston, Mass.

Soil Stabilization

150. "High-Service, Low Cost Roads" is one of the newer booklets using an effective combination of picture and text to set forth the principles and advantages of road surface stabilization with calcium chloride. Complete, interesting and well illustrated. 34 pages. Sent by Solvay Sales Corp., 40 Rector St., New York, N. Y.

152. The Columbia Chemical Division will be glad to furnish to anyone interested complete information dealing with Calcium Chloride Stabilized Roads. This literature contains many charts, tables and useful information and can be obtained by writing Columbia Chemical Div., Pittsburgh Plate Glass Co., Grant Bldg., Pittsburgh, Pa.

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154. "Soil Stabilization with Tarvia"—An illustrated booklet describing The steps in the stabilization of roadway soil with Tarvia will be mailed on request by The Barrett Div., 40 Rector St., New York, N. Y.

Spreader

187. Jaeger Paving equipment, including Mix-in-Place Roadbuilders, Bituminous Pavers, Concrete Bituminous Finishers, Adjustable Spreaders, Forms, etc.—4 complete catalogs of latest equipment in one cover, issued by The Jaeger Machine Company, 400 Dublin Ave., Columbus, Ohio.

Surface Consolidation and Maintenance

188. Detailed and illustrated presentation of the method and procedure in consolidated operations; explains how sub-soils can be conditioned to resist softening and frost action; how surfacing can be consolidated to provide smooth all-weather riding surfaces; how they can be maintained so as to prevent disintegration and gravel loss. Write the Calcium Chloride Association, Penobscot Bldg., Detroit, Mich., for Bulletin No. 29.

Timber Structures

189. "Typical Designs of Timber Structures" contains plans for 45 representative structures that have been engineered with Teco Connectors. For free copy write Timber Engineering Co., Inc., Room 6GG, 1319—18th St., N. W., Washington, D. C.

Wellpoints

195. New complete catalog, "Griffin Pointed Wellpoint Facts," just issued. Covers pre-drainage, describing wellpoints jetting pumps, with tables, diagrams and illustrations. Griffin Wellpoint Corp., 881 E. 141st St., New York.

Street and Paving Maintenance

290. "Blacktop Road Maintenance and Construction Equipment"—Asphalt and tar kettles, flue type kettles, spray attachments with completely submerged pumps, tool heaters, surface heaters, road brooms, portable trail-o-rollers, etc. These are all described in detail and illustrated. This modern and up-to-date equipment for blacktop airport and road construction and maintenance is based upon experience and engineering research over a period of 42 years. Write for Catalog R. Littleford Bros., Inc., 452 East Pearl St., Cincinnati 2, O.

Fire Apparatus

300. Detailed information and advice about specially engineered Ward LaFrance apparatus will be sent on request. Ward LaFrance Div., Elmira, N. Y.

Snow Fighting

Snow Plows

350. "Frink One-Way Sno-Plows" is a four page catalog illustrating and describing 5 models of One-Way Blade Type Sno-Plows for motor trucks from 1½ up to 8 tons capacity. Interchangeable with V Sno-Plow. Features, specifications and method of attaching. Carl H. Frink, Mfr., Clayton, 1000 Islands, N. Y.

Ice Control

351. "Make Icy Highways Safe for Traffic"—a new bulletin by Michigan Alkali Div., Wyandotte Chemicals Corp., Wyandotte, Mich., tells how to use calcium chloride for modern ice control.

Sanitary Engineering

Aero-Filter

356. "Results Produced by Aero-Filters" is a new pamphlet covering results at Temple, Texas; Paris, Ill.; Webster City, Iowa; and Mason, Mich. Write Lakeside Engineering Corp., 222 West Adams St., Chicago, Ill.

Air Release Valves

357. Automatic Air Release Valves for water, sewage and industrial uses are described and illustrated in new catalog issued by Simplex Valve & Meter Co., 6750 Upland St., Philadelphia, Pa.

Analysis of Water

360. "Methods of Analyzing Water for Municipal and Industrial Use" is an excellent 94 page booklet with many useful tables and formulas. Sent on request by Solvay Sales Corp., 40 Rector St., New York, N. Y.

Activation and Aeration

376. A valuable booklet on porous diffuser plates and tubes for sewage treatment plants. Covers permeability, porosity, pore size and pressure loss data, with curves. Also information on installations, with sketches and pictures, specifications, methods of cleaning and studies in permeability. 20 pp. illustrated. Sent on request to Norton Company, Worcester, Mass.

Blowers

378. All interested in low cost air for sewage disposal will want a copy of this catalog describing operating principles and specifications of Roots-Connersville Aerating Blowers. Write to Roots-Connersville Blower Corp., 301 Valley Ave., Connersville, Ind.

Chlorinators, Portable

379. Complete data on new portable chlorinator designed to meet emergency calls quickly and efficiently. Write Wallace & Tiernan Co., Inc., Newark, N. J.

380. "Emergency Sterilization Equipment," a new bulletin describing the advantages of Dual Drive Chlor-O-Feeders which can serve as either a permanent chemical feeder or as a portable emergency chlorinator. Order from Proportioneers Inc., 96 Codding St., Providence, R. I.

Cleaning Sewers With Own Forces

381. A 20-page booklet describes and illustrates a full line of sewer cleaning equipment—Rods, Root Cutters, Buckets, Nozzles and Flushers. Write W. H. Stewart (Pioneer Mfr. since 1901), Jacksonville, Fla., or P. O. Box 767, Syracuse, N. Y.

Cleaning Mains

383. 32-page illustrated booklet explains how a city can clean its sewers and culverts with its own forces using the up-to-date Flexible Sewer Rod equipment. Illustrates and describes all necessary equipment. Issued by Flexible Sewer Rod Equipment Co., 9059 Venice Boul., Los Angeles, Calif.

Consulting Engineers

384. "Who, What, Why" outlines briefly the functions of the consulting chemist and chemical engineer. Covers various methods of cooperation, on different types of problems, with industry, with attorneys and with individuals. Foster D. Snell, Inc., 305 Washington St., Brooklyn, N. Y., will send a copy on request.

Feeders, Chlorine, Amonia and Chemical

385. For chlorinating water supplies, sewage plants, swimming pools and feeding practically any chemical used in sanitation treatment of water and sewage. Flow of water controls dosage of chemical; reagent feed is immediately adjustable. Starts and stops automatically. Literature from % Proportioneers, Inc. % 96 Codding St., Providence, R. I.

386. New circular describes and illustrates the Var-I-Feeder, a new portable chemical feeder for water main sterilization, military use or other chemical treatment. Write Chem-Feeds, Inc., 77 Reservoir Ave., Providence, R. I.

387. Everson Sterelators for all kinds of chemical feeding in stationary and portable models are described in new bulletins issued by Everson Manufacturing Co., 214 West Huron St., Chicago, Ill.

Filters

388. How to increase the capacity of filters through use of Anthrafilt and complete data on use of Anthrafilt for filters and sludge beds is contained in a revised pocket Manual issued by Anthracite Equipment Corp. For free copy write H. G. Turner, State College, Pa.

Fire Hydrants

390. Specifications for standard AWWA fire hydrants with helpful instructions for ordering, installing, repairing, lengthening and using. Issued by M & H Valve & Fittings Co., Anniston, Ala.

391. See listing No. 410.

Flow Meters

392. The primary devices for flow measurement—the orifice, the pilot tube, the venturi meter and others—and the application to them of the Simplex meter are described in a useful 24-page booklet (42A). Simplex Valve and Meter Co., 6750 Upland St., Philadelphia, Pa.

Gas Holders and Digesters

393. Clarifiers, sludge digesters and other tanks and gas holders for sludge gas. Graver Tank & Mfg. Co., Inc., 332 So. Michigan Ave., Chicago, Ill.

Gates, Valves, Hydrants

394. Gate, flap and check valves; floor stands and fittings. New catalog No. 34 gives detail information with dimensions for all types of new full line. M. & H. Valve & Fittings Co., Anniston, Ala.

395. Complete booklet with much worthwhile water works data describes fully Ludlow hydrants and valves. Sent on request. Ludlow Valve Mfg. Co., Troy, N. Y.

396. See listing No. 410.

Gauges

398. The full line of Simplex gauges for filtration plants are illustrated and described in catalog issued by Simplex Valve and Meter Co., 6750 Upland St., Philadelphia, Pa.

Laboratory Equipment

403. pH and Chlorine Control. A discussion of pH control and description of comparators, chlorimeters and similar devices. An 80-page booklet. W. A. Taylor & Co., 7301 York Road, Baltimore, Md.

Maintenance

404. "The Lubriplate Way" contains much valuable information on long-lasting Lubriplate lubricants which are especially adapted for difficult conditions such as parts that are immersed in sewage, water or steam. Write Lubriplate Division of Fiske Brothers Refining Co., 129 Lockwood St., Newark, N. J.

Manhole Covers and Inlets

405. Street, sewer and water castings in various styles, sizes and weights. Manhole covers, water meter covers, adjustable curb inlets, gutter crossing plates, valve and lamphole covers, ventilators, etc. Described in catalog issued by South Bend Foundry Co., Lafayette Boul. and Indiana Ave., South Bend, Ind.

Meters, Venturi

406. New bulletin illustrates Builders Air Relay system of transmission for the Venturi Meter which is particularly useful for liquids containing suspended solids like sewage. Eliminates corroson, clogged pipes, etc. Write Builders-Providence, Inc., Codding St., Providence, R. I.

Pipe, Cast Iron

408. Handbook of Universal Cast Iron Pipe and Fittings, pocket size, 104 pages, illustrated, including 14 pages of useful reference tables and data. Sent by The Central Foundry Co., 386 Fourth Ave., New York 16, New York.

409. Cast iron pipe and fittings for water, gas, sewer and industrial service. Super-deLavaud centrifugally-cast and pit-cast pipe. Bell-and-spigot, U. S. Joint, flanged or flexible joints can be furnished to suit requirements. Write U. S. Pipe and Foundry Co., Burlington, N. J.

410. "Cast Iron Pipe and Fittings" is a well illustrated 44 page catalog giving full specifications for their complete line of Sand Spun Centrifugal Pipe, Fire Hydrants, Gate Valves, Special Castings, etc. Will be sent promptly by R. D. Wood Co., 400 Chestnut St., Philadelphia, Pa.

Pipe, Lock Joint

412. Lock Joint Reinforced Concrete Sewer Pipe. Pressure Pipe, Culvert Pipe, Centrifugal Pipe and Subaqueous Pipe is described and illustrated in bulletins available from Lock Joint Pipe Co., Ampere, N. J.

Pipe, Transite

414. Two new illustrated booklets, "Transite Pressure Pipe" and "Transite Sewer Pipe" deal with methods of cutting costs of installation and maintenance of pipe lines and summarize advantages resulting from use of Transite pipes. Sent promptly by Johns-Manville Corp., 22 East 40th St., New York, N. Y.

Pipe Joints Sewer

415. How to make a better sewer pipe joint of cement—tight, minimizing root intrusion, better alignment of joint. Permits making joints in water-bearing trenches. General instructions issued by L. A. Weston, Adams, Mass.

Pipe, 2-inch Cast Iron

417. Generously illustrated booklet describes McWane 2-inch cast iron pipe and its manufacture in streamlined pipe shop. Write McWane Cast Iron Pipe Co., Birmingham 2, Ala.

Pipe Joint Compounds

418. The uses of Tegul-Mineralead for bell and spigot pipe and G-K Sewer joint compound are described in a 16-page illustrated booklet issued by Atlas Mineral Products Co., Mertztown, Pa. Includes useful tables for estimating quantities needed.

Pumps and Well Water Systems

420. Installation views and sectional scenes on Layne Vertical Centrifugal and Vertical Turbine Pumps fully illustrated and including useful engineering data section. Layne Shutter Screens for Gravel Wall Wells. Write for descriptive booklets. Advertising Dept., Layne & Bowler, Inc., Box 186, Hollywood Station, Memphis, Tenn.

Meter Setting and Testing

430. The most complete catalog we have seen on setting and testing equipment for water meters—exquisitely printed and illustrated 48-page booklet you should have a copy of. Ask Ford Meter Box Co., Wabash, Ind.

Screens

434. Be assured of uninterrupted, constant automatic removal of screenings. Folder 1587 tells how. Gives some of the outstanding advantages of "Straightline Bar Screens" (Vertical and Inclined types). Link-Belt Co., 2045 W. Hunting Park Ave., Philadelphia, Pa.

Sludge Drying and Incineration

440. "Disposal of Municipal Refuse." Complete specifications and description including suggested form of proposal; form of guarantees; statements and approval sheet for comparing bids with diagramatic outline of various plant designs. 18 pages. Address: Morse Boulger Destructor Co., 216-P East 45th St., New York 17, N. Y.

442. Recuperator tubes made from Silicon Carbide and "Fireclay" Corebusters for maximum efficiency are described and illustrated in bulletin No. 11 issued by Fitch Recuperator Co., Plainfield National Bank Bldg., Plainfield, N. J.

443. Nichols Herreshoff incinerator for complete disposal of sewage solids and industrial wastes—a new booklet illustrates and explains how this Nichols incinerator works. Pictures recent installations. Write Nichols Engineering and Research Corp., 60 Wall Tower, New York, N. Y.

Softening

444. This folder explains the process of Zeolite water softening and describes and illustrates the full line of equipment for that purpose made by the Graver Tank & Mfg. Co., 332 So. Michigan Ave., Chicago, Ill. Includes flow charts, tables and other valuable data. Write for a copy of this instructive folder.

445. Water Softening. The use of the Spaulding Precipitator to obtain maximum efficiency and economy in water softening is described in a technical booklet. Permutit Co., 330 W. 42nd St., New York 18, N. Y.

Sprinkling Filters

447. Design data on sprinkling filters of Separate Nozzle Field and Common Nozzle Field design as well as complete data on single and twin dosing tanks, and the various siphons used in them, for apportioning sewage to nozzles. Many time-saving charts and tables. Write Pacific Flush Tank Co., 4241 Ravenswood Ave., Chicago, Ill.

Swimming Pools

448. Data and complete information on swimming pool filters and recirculation plants; also on water filters and filtration equipment. For data prices, plans, etc., write Roberts Filter Mfg. Co., 640 Columbia Ave., Darby, Pa.

Taste and Odor Control

449. "Taste and Odor Control in Water Purification" is an excellent 92-page, illustrated booklet covering sources of taste and odor pollution in water supplies and outlining the various methods of treatment now in use. Every water works department should have a copy. Write Industrial Chemical Sales Div., 230 Park Ave., New York, N. Y.

450. Technical pub. No. 207 issued by Wallace & Tiernan Co., Inc., Newark, N. J., describes in detail taste and odor control of water with BREAK-POINT Chlorination, a method of discovering the point at which many causes of taste may be removed by chlorination with little or no increase in residual chlorine. Sent free to any operator requesting it.

453. "Safe Sanitation for a Nation," an interesting booklet containing thumbnail descriptions of the different pieces of P.F.T. equipment for sewage treatment. Includes photos of various installations and complete list of literature available from this company. Write Pacific Flush Tank Co., 4241 Ravenswood Ave., Chicago Ill.

454. A full line of equipment for sewage disposal including clarifiers, chemical treatment plants, rotary distributors, gas holders and many other pieces of equipment are described in a new bulletin just issued by Graver Tank & Mfg. Co., 332 So. Michigan Ave., Chicago, Ill.

455. New booklet (No. 1642 on Link-Belt Circuline Collectors for Settling Tanks contains excellent pictures; drawings of installations, sanitary engineering data and design details. Link-Belt Company, 2045 W. Hunting Park Ave., Philadelphia.

456. New 16-page illustrated catalog No. 1742 on Straightline Collectors for the efficient, continuous removal of sludge from rectangular tanks at sewerage and water plants. Contains layout drawings, installation pictures, and capacity tables. Address Link-Belt Co., 2045 West Hunting Park Ave., Philadelphia, Pa.

457. New illustrated folder (1942) on Straightline apparatus for the removal and washing of grit and detritus from rectangular grit chambers. Address: Link-Belt Co., 2045 W. Hunting Park Ave., Philadelphia, Pa.

458. "Sedimentation with Dorr Clarifiers" is a complete 36-page illustrated catalog with useful design data. Ask The Dorr Company, 570 Lexington Ave., New York 22, N. Y.

459. A combination mechanical clarifier and mechanical digester, The Dorr Clarigester, is explained and illustrated in a bulletin issued by The Dorr Company, 570 Lexington Ave., New York 22, N. Y.

461. Preflocculation without chemicals with the Dorrco Clariflocculator in a single structure is the subject of a new booklet issued by The Dorr Company, 570 Lexington Ave., New York 22, N. Y.

462. Dorrco Monorake for existing rectangular sedimentation tanks, open or closed, is described and illustrated in a new catalog sent on request. The Dorr Co. 570 Lexington Ave., New York 22, N. Y.

465. Grit Washers and Collectors, by Jeffrey are built in three types: scraper, V-bucket and combination. For full details ask for Jeffrey Catalog No. 703-A. Jeffrey Mfg. Co., 948-99 No. Fourth St., Columbus, Ohio.

466. Flocculation with Floctrols. For details on controlled flocculation, tapered mixing, practical elimination of short circuiting, rapid settling of properly flocculated solids write for Catalog No. 703-A. Jeffrey Mfg. Co., 948-99 No. Fourth St., Columbus, Ohio.

Underdrains, Trickling Filter

468. Illustrated bulletin describes the Natco Unifilter block of glazed, hard burned clay for underdraining filter beds. Write National Fireproofing Corp., Pittsburgh, Pa., for free copy.

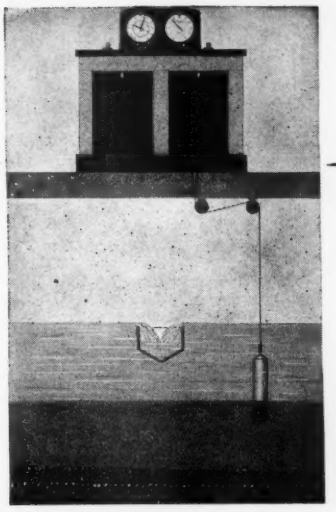
Valves (See Gates, Air Release, etc.)

Water Treatment

470. If you have a water conditioning problem of any kind, write Graver Tank & Mfg. Co., 332 So. Michigan Ave., Chicago, Ill., who manufacture all types of conditioning equipment and will be pleased to make recommendations.

Water Service Devices

500. Data on anti-freeze outdoor drinking fountains, hydrants, street washers, etc., will be sent promptly on request to Murdock Mfg. & Supply Co., 426 Plum St., Cincinnati, Ohio.



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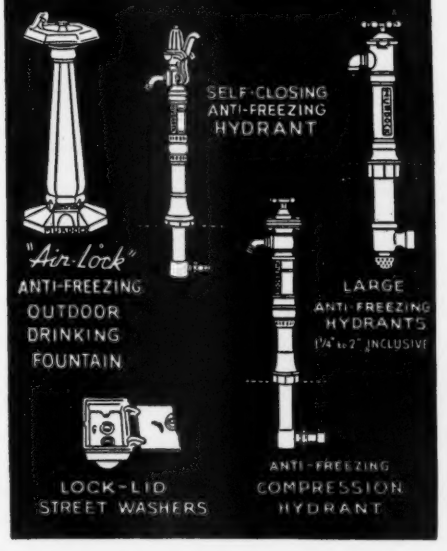
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(Continued from page 54)

ton on July 8th. He became President upon the death of his father in 1899 and held that office until his death. Throughout his long business career he unceasingly endeavored to make his business a constructive force in the community and to serve faithfully all connected with it whether as stockholders, employees, customers or suppliers.

Mr. Chafee was a graduate of Brown University and lavished a deep and abiding affection for that noted educational institution and was always at its call for whatever services asked.

Everson Appointments

Everson Mfg. Co., makers of Chlorine Control and Swimming Pool equipment, has appointed the following representatives: B and B Engineering and Supply Co., Inc., 2900 Washington Ave., Houston, Texas; Chas. H. Alexander & Son Co., 2746 Elmwood Drive, S. E., Grand Rapids, Michigan; J. Edwin Aspinall, 314 E. New York St., Indianapolis, Ind.; J. D. Homan, 614 S. Dakota Avenue, Tampa, Fla.; R. W. Rassbach, 7706-14th St., N. W. Washington, D. C.

Foster D. Snell, Inc. Increases Staff

Increased activity in research in the Rubber and Plastic Department of Foster D. Snell, Inc., has required the addition of three new members to its staff. The new members are Irving Merdinger, B. S., New York University, formerly with U. S. Rubber Company; Madlyn M. Sheldrick, B. S., Brooklyn College and Ascher Wollison, B. S., recent graduate of the College of the City of New York.

Agatina Carbonaro, M. A., Columbia University, formerly with the Arabol Manufacturing Company, is now a member of the analytical staff of Foster D. Snell, Inc.

NEW APPOINTMENTS

New City and County Officials recently reported:

City Engineers

Morton A. Leber, Roselle, N. J.
Richard C. White, Buffalo, N. Y.
Harlan T. Brown, Las Vegas, Nevada

City Manager

Arthur E. Johnson, Calrinda, Iowa

Water Works Superintendents

M. E. Shanahan, Acting, Boulder, Colo.
Frank J. Thiery, Bristol, Conn.
George B. Zeigler, DeLand, Fla.
Fred Youmans, Waycross, Ga.
Ed. Dowling, Hammond, Ind.
Edward J. Kindler, Huntington, Ind.
Charles Scholl, New Castle, Ind.
Warner Lang, Waterloo, Iowa.
Bill Tilford, Morganfield, Ky.
Fred Anable, East Grand Rapids, Mich.
Lester Goble, No. Platte, Nebr.
A. J. Clements, Princeton, N. J.
Wm. Mellinger, Gallup, N. Mexico
Arthur G. Jewell, Mt. Vernon, N. Y.
Patrick F. Cleary, Yonkers, N. Y.
Howard L. Moore, Girard, Ohio
Paul N. Gardner, Hamilton, Ohio
A. B. Jewell, Acting, Tulsa, Okla.
Nel Stephens, Fort Worth, Tex.
Alton Eames, Logan, Utah
H. K. Burton, Salt Lake City, Utah
H. T. Oberly, St. Petersburg, Fla.
Wm. Rushton, Idaho Falls, Idaho
Bushrod Sattley, Decatur, Ill.
Tobia Walden, Jasper, Ind.

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